ESTEEM

Wireless Modems

ESTeem MODEL 195Eg
USER'S MANUAL

Manual Revision 2.6
October 2008

Electronic Systems Technology, Inc.

ESTeem MODEL 195Eg
USER'S MANUAL

Manual Revision 2.6

Firmware Version 271 and above

October 2008

Prepared by: _____ **Date:** _____
Name: Eric P. Marske
Title: Product Manager

Approved by: _____ **Date:** _____
Name: Tom L. Kirchner
Title: President

COPYRIGHT INFORMATION

This manual and the firmware described in it are copyrighted by EST, with all rights reserved. Under the copyright laws, this manual or the firmware internal to the ESTeem unit may not be copied, in whole or part, without the written consent of EST. Under the law, copying includes translating into another language.

Electronic Systems Technology (EST) cannot guarantee that you will receive notice of a revision to the firmware described in the manual, even if you have returned a registration/warranty card received with the product. You should periodically check with your authorized EST dealer or call factory direct.

EST and the EST logo are registered trademarks of Electronic Systems Technology, Inc. Simultaneously published in the United States and Canada. All rights reserved.

WARRANTY INFORMATION

Electronic Systems Technology, Inc., (hereinafter EST) expressly warrants its products as free of manufacturing defects for a period of one year from the date of sale to first user/customer.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED AND THERE IS EXPRESSLY EXCLUDED ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO OTHER WARRANTY GIVEN BY ANY EMPLOYEE, AGENT, DISTRIBUTOR OR OTHER PERSON WITH RESPECT TO THE PRODUCT SHALL BE BINDING ON EST.

LIMITATION OF LIABILITY:

EST's liability shall be limited to refunding of purchase price, repair or replacement of product.

IN NO EVENT SHALL EST HAVE LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL OR EXEMPLARY DAMAGES CAUSED DIRECTLY OR INDIRECTLY BY THE PRODUCT, INCLUDING BUT NOT LIMITED TO ANY INTERRUPTION OF SERVICES, LOSS OF BUSINESS OR ANTICIPATORY PROFITS. IN NO EVENT SHALL EST BE LIABLE FOR ANY DAMAGES WHATSOEVER IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT.

In the event that a unit or part requires replacement or factory servicing, the following conditions apply:

a) Customer must obtain from EST an authorized RMA (Return Materials Authorization) number (call 509-735-9092 Customer Support) before shipment of product or parts to EST for any reason;
b) If the whole unit is shipped, it must be in its original carton and shipping components, or a carton and shipping components supplied by EST, or if parts only are shipped, they must be packaged and cushioned so as to prevent damage in transit and shipped freight prepaid;

PRODUCT WILL BE CONSIDERED OUT OF WARRANTY IF:

a) If the product is damaged due to improper or abnormal use, abuse, mishandling, accident or improper maintenance or failure to follow operating instruction;
b) If the product is defective as a result of sand, dirt, or water damage;
c) If any factory-sealed enclosure has been opened or shows evidence of an attempt to be opened;
d) If defects or damage are caused by the use of unauthorized parts or unauthorized service;
e) If the product has had its serial numbers altered or removed.

Warranty repair form must be accompanied by proof of user's purchase of unit. Product must be shipped to the manufacturer at the following address:

Electronic Systems Technology
415 North Quay Street
Building B-1
Kennewick, Washington USA 99336

ADDITIONAL SERVICE:

If EST releases an improvement update to firmware internal to the ESTeem unit during the 90 day period after the unit was purchased by the first user/customer, EST will update the applicable unit with the revised version at no charge other than for UPS handling and shipping to and from your location to the EST factory. Return of any such item must be accompanied with proof of purchase.

TABLE OF CONTENTS

CHAPTER 1 – INTRODUCTION

Before You Begin 1-1

Model 195Eg Overview 1-1

Model 195Eg Configuration Modes 1-1
- Access Point Modes ---------- 1-2
- Access Point Repeater ---------- 1-3
- Self-Healing Mesh Network ---------- 1-3
- Station (802.11g Client) Modes ---------- 1-3
- Serial Applications (Optional) ---------- 1-4

CHAPTER 2 – CONFIGURATION DIAGRAMS

Model 195Eg Access Point Configurations 2-1
- Figure 1: Single Access Point Bridge Diagram ---------- 2-1
- Figure 2: Multiple Access Point Bridge Diagram ---------- 2-1
- Figure 3: Access Point Router Diagram ---------- 2-2
- Figure 4: Access Point Masquerade Diagram ---------- 2-2

Model 195Eg Access Point Repeater with Clients Configurations 2-3
- Figure 5: Access Point Bridge Repeater with Clients Diagram ---------- 2-3
- Figure 6: Access Point Router Repeater with Clients Diagram ---------- 2-3
- Figure 7: Access Point Masquerade Repeater with Clients Diag. ---------- 2-4

Model 195Eg Building to Building Configurations 2-4
- Figure 8: Building to Building Configuration Diagram ---------- 2-4
- Figure 9: Building to Building with Repeater Diagram ---------- 2-5
- Figure 10: Building to Building Router Diagram ---------- 2-5

Model 195Eg Complete Wireless Solutions 2-6
- Figure 11: Complete Bridge Network Solutions Diagram ---------- 2-6
- Figure 12: Complete Router Network Solutions Diagram ---------- 2-7

Model 195Eg Serial Network Configurations 2-8
- Figure 13: Point to Point Serial Diagram ---------- 2-8
- Figure 14: Point to Point with Repeater Serial Diagram ---------- 2-8
- Figure 15: Multi-point Serial Diagram ---------- 2-9
- Figure 16: Ethernet and Serial Diagram ---------- 2-9

CHAPTER 3 – STARTING OUT

Overview 3-1
- Quick Start Guide ---------- 3-1

Model 195Eg Hardware Layout 3-1
- Required Hardware ---------- 3-1
- Front Panel Overlay Diagram ---------- 3-2
- Antenna Port Overview ---------- 3-2
- Antenna Configuration ---------- 3-3
- Hardware Configuration Diagram ---------- 3-3

TABLE OF CONTENTS

ESTeem Discovery Utility 3-5
Installation ---------- 3-5
Operation ---------- 3-6
Configuring the IP Address ---------- 3-6

Using the RS-232 Interface 3-7
Installing ESTeem Utility Program ---------- 3-7
Using the RS-232 Configuration Utility ---------- 3-7

CHAPTER 4 – WEB CONFIGURATION

Logging Into Web Configuration Manager 4-1

Web Configuration Manager 4-2
Top Menu ---------- 4-2
Setting ModemID Field ---------- 4-2
Status Menu ---------- 4-3
System Log Screen ---------- 4-5
Setup Screen ---------- 4-5
Advanced Configuration Screen ---------- 4-6
Backup Screen ---------- 4-6
Restore Screen ---------- 4-7
Software Update ---------- 4-8
System Reboot ---------- 4-8

CHAPTER 5 – EXAMPLE CONFIGURATIONS

Programming Example 5-1
Programming Example #1 Diagram ---------- 5-1
Programming Example #2 Diagram ---------- 5-2
Table 1: Example System Configuration Table ---------- 5-2

Example 1 – Plant Network (Access Point Router Repeater) 5-3

Example 2 –Repeater (Access Point Bridge Repeater) 5-13

Example 3 – Remote Building (Access Point Bridge Repeater) 5-18

Example 4 – EtherStation Mode 5-19

Example 5 – Station Router Mode 5-21

Example 6 – Station Masquerade Mode 5-25

Router Addressing Examples 5-28
Point to Point Access Point Router to Station Router ---------- 5-28
Stand-Alone Access Point Router to Single Station Router ---------- 5-29
Stand-Alone Access Point Router to Multiple Station Routers ---------- 5-30

CHAPTER 6 – SERIAL APPLICATIONS

Serial Overview 6-1

Serial Connections 6-1
Second Ethernet Port ---------- 6-1

Serial Configuration 6-1

CHAPTER 7 – REPEATING FEATURES

Overview 7-1
ESTeem Mesh Network 7-1
Configuration ---------- 7-1

Rapid Spanning Tree Protocol (RSTP) 7-2

Spanning Tree Protocols (STP) 7-2
Overview ---------- 7-2
Phases ---------- 7-3
Priority and Path Cost ---------- 7-4
Root Bridge ---------- 7-4

Redundant Backup 7-5

CHAPTER 8 – ANTENNA SETUPS

Antenna and Cable Configurations (Pole Mount) 8-1

Antenna and Cable Configurations (Cabinet Mount) 8-2

Coaxial Cable Attenuation 8-2

Antenna Diversity 8-4

Antenna Port Selection 8-4

Assembling the AA195PM Outdoor Pole Mounting Kit 8-4

195E Grounding Procedure 8-4

Model 195Eg Series with Direct Mount Dual Diversity Antennas 8-11
Model 195Eg Direct Mount Antennas with Surge Protection 8-12
Model 195Eg Series with External Mount Antenna 8-13
Model 195Eg External Mount Antenna with Surge Protection 8-14
Model 195Eg Series Cabinet Mount Antenna 8-15

Fresnel Zone 8-16

APPENDIX A – FCC INFORMATION

TABLE OF CONTENTS

APPENDIX B – SPECIFICATIONS

195Eg Specifications ---------- B-1
Case Diagram ---------- B-2
Antenna Specifications ---------- B-3

APPENDIX C – INTERFACE PORTS

Ethernet Interface ---------- C-1
Setting DHCP Server ---------- C-1
RS-232 Programming Port Pin-Out ---------- C-2
RS-232 Data Port Pin-Out ---------- C-2

APPENDIX D – RADIO CONFIGURATION

Frequency of Operation ---------- D-1
Setting Data Rates ---------- D-1
Setting RF Power Level ---------- D-3
Average RF Output Power ---------- D-4

APPENDIX E – SECURITY

APPENDIX F – TROUBLESHOOTING

Testing Communication Link ---------- F-1
Viewing RF Data Rates ---------- F-2
Signal Strength vs Data Rates ---------- F-4
Updating 192E to Operate with 195Eg ---------- F-4
Setting Maximum Distance Value ---------- F-6
Troubleshooting Tips ---------- F-7

APPENDIX G – Utilities and Features

Using ESTeem Discovery Program ---------- G-1
Using EtherStation Status Program ---------- G-4
Setting Local Time 195Eg ---------- G-5
Configuring Time Server ---------- G-6
VLAN Operation ---------- G-8
IGMP Snooping ---------- G-9
Simple Network Management Protocol (SNMP) ---------- G-14

APPENDIX H – Quick Start Guide

CHAPTER 1
INTRODUCTION

BEFORE YOU BEGIN

Thank you and congratulations on your purchase of the ESTeem Model 195Eg Wireless Ethernet Radio Modem! This manual was written to help both the first time and advanced user of the 195Eg configure the radio modem for your application. If this your first time configuring the 195Eg and you would like to get going as soon as possible, we recommend using the *195Eg Quick Start Guide* provided with the modem. A copy of the guide is listed in the appendix of this manual for your reference.

The ESTeem 195Eg is a very versatile wireless Ethernet networking device. To keep the manual usably short, many of the application descriptions and programming details assume the user has a good working knowledge of the following network concepts:

- General Ethernet networking and the configuration of LAN topologies
- Common Ethernet terminology and acronyms
- TCP/IP network protocol structure and how to configure TCP/IP networks and subnets
- How to identify and set the TCP/IP address on your computer
- Have administrator privileges to the computer and network you are configuring
- If using routing protocols, you must be able to identify and configure the network routers, gateways and firewalls
- You must be familiar with using web browser software such as Internet Explorer, Netscape or Mozilla

If you are unfamiliar with any of the above networking concepts, you may need to contact your network administrator for assistance.

MODEL 195Eg OVERVIEW

The ESTeem Model 195Eg is an IEEE 802.11g protocol compatible wireless LAN transceiver that can be used to build a Wireless Local Area Network (WLAN) for line-of-sight distances to 13 miles for fixed base and 5 miles for mobile applications. The 195Eg can provide RF data rates up to 54 Mbps and can have an optional serial port for legacy RS-232 devices. The Model 195Eg is also downward compatible with IEEE 802.11b protocol networks. The IEEE 802.11 WLAN was designed to look and feel like any IEEE 802 wired LAN. The Model 195Eg is a very sophisticated networking device that can be configured for multiple modes of operation depending upon the needs of the wireless and wired LAN system. The following configuration modes are provided as an overview of the basic network types, as all possible network configurations can not be listed. For further help in selecting the correct network type, please contact Customer Support at 509-735-9092.

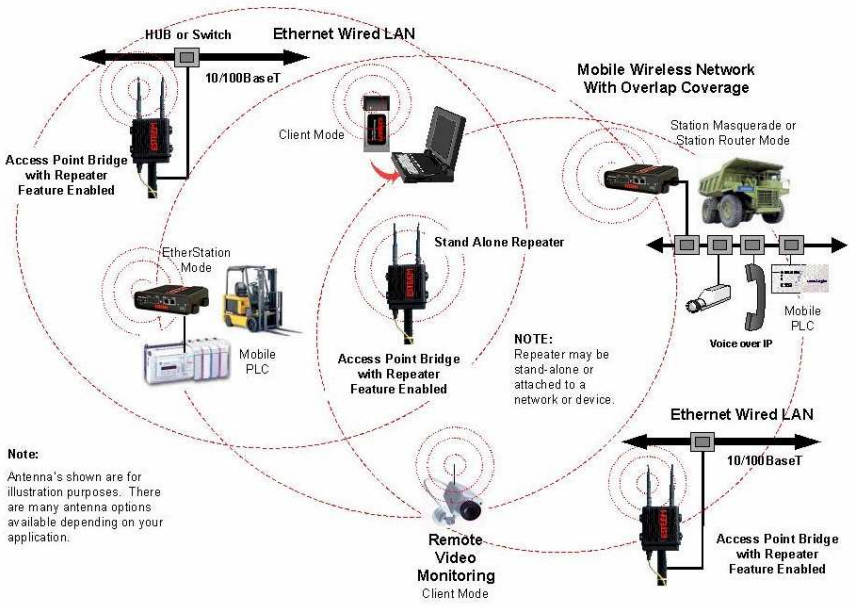


Figure 1- Access Point Bridge Diagram

MODEL 195Eg CONFIGURATION MODES

The Model 195Eg can be configured for multiple modes of operation without any changes to the hardware:

Access Point Modes

1. **Access Point Bridge Mode**. When the Model 195Eg is configured as an Access Point it will provide a wireless bridge from a hardwired Local Area Network (LAN) to laptops, office computers, Personal Digital Assistants (PDA's), video cameras, PLC's, etc. that have integral or external 802.11g or 802.11b wireless devices or other Model 195Eg modems in client modes. Multiple Access Point Bridge modems can be physically connected to the same network (LAN) or through a radio link using the Access Point Repeater mode to provide overlapping, seamless Ethernet communication for mobile devices. The ESTeem Model 195Eg in Access Point Bridge mode will pass all network traffic between connected devices including global network broadcasts. See Figure 1.

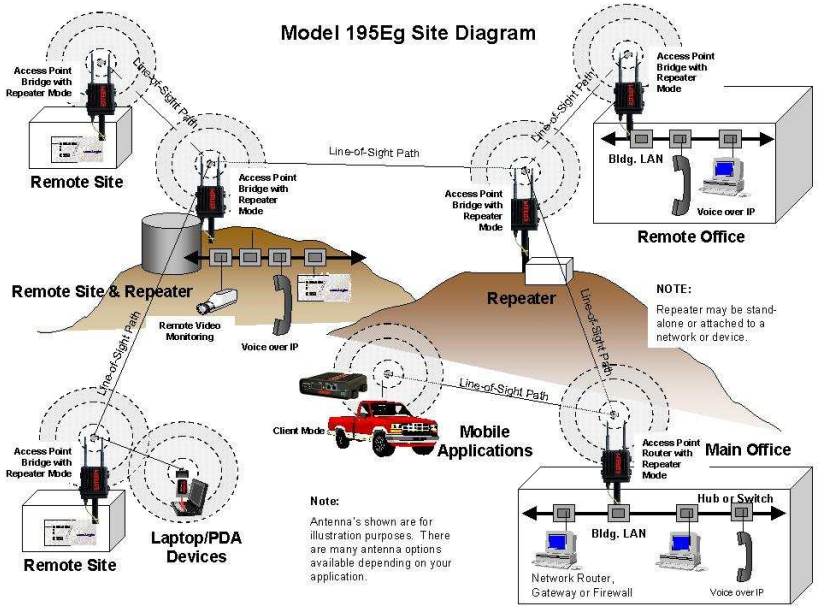


Figure 2 – Repeater Mode Diagram

2. **Access Point Router Mode**. In this mode the ESTeem Model 195Eg will function as a router between the wired Ethernet network, connect to the 195Eg's Ethernet port, and the wireless network of 802.11g/b clients and other 195Eg's in repeater peer mode. As in all standard router configurations, the wireless and wired Ethernet networks will need to be on separate subnets. To communicate from the wired Ethernet network to devices on the wireless network, a separate router (in addition to the Model 195Eg) is required. The 195Eg in Access Point Router mode will pass network traffic for connected devices but will block global network broadcasts from the wired network. This mode of operation should be used instead of the Access Point Bridge mode when a separation between networks is required or the ESTeem is connected to larger LAN Networks that will continuously send global network broadcasts (Figure 2).

3. **Access Point Masquerade Mode**. The Access Point Masquerade mode is a special use of the Access Point mode where the Model 195Eg will connect 802.11g or 802.11b wireless devices as clients into a single static IP address on a wired network. Data requests from the wireless network will be processed through the Access Point Masquerade 195Eg, but any request from the wired Ethernet network to devices on the wireless network will

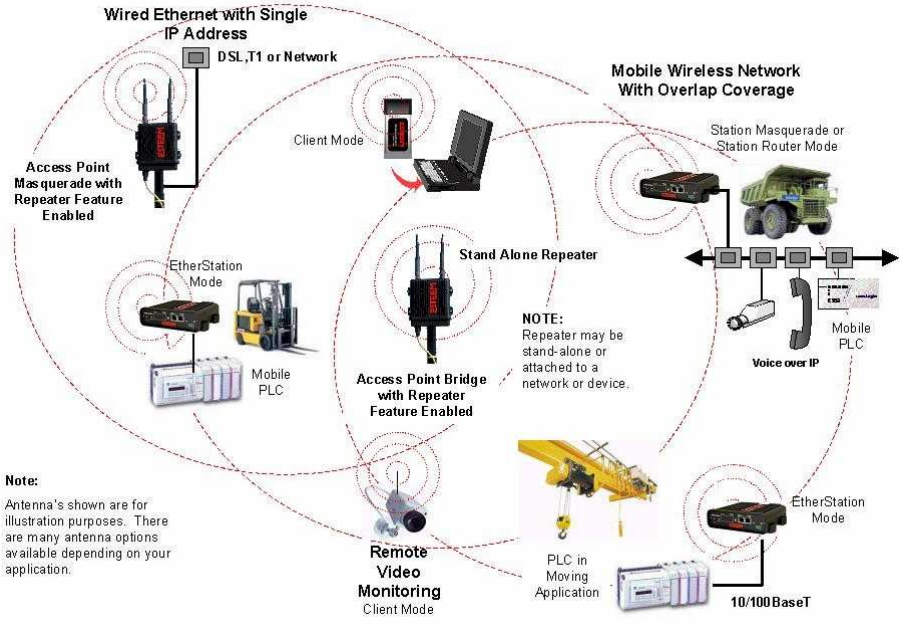

Wired Ethernet with Single IP Address
DSL,T1 or Network
Mobile Wireless Network With Overlap Coverage
Access Point Masquerade with Repeater Feature Enabled
Client Mode
Station Masquerade or Station Router Mode
EtherStation Mode
Stand Alone Repeater
NOTE:
Repeater may be stand-alone or attached to a network or device.
Mobile PLC
Voice over IP
Access Point Bridge with Repeater Feature Enabled
Note:
Antenna's shown are for illustration purposes. There are many antenna options available depending on your application.
Remote Video Monitoring
Client Mode
PLC in Moving Application
EtherStation Mode
10/100BaseT

Figure 3- Access Point Masquerade Diagram

be rejected similar to the operation of a "firewall". The 195Eg will hide all the IP addresses connected on the wireless link. You should use this mode of operation if Model 195Eg is connected directly to the Internet with a static IP address (DSL, T1, etc.) and you want the wireless clients to access the information through the Model 195Eg (Figure 3). This mode should also be used for attaching the Model 195Eg to a network where few IP addresses are available or a firewall for the wireless clients is required.

4. **Access Point Repeater**. The Access Point Repeater is a unique enhancement of the 802.11g Access Point mode only available the ESTeem Model 195Eg. The Access Point Repeater can be used with any of the above Access Point modes. With this repeater feature enabled, the Model 195Eg Access Points do not have to be hardwired together on the same physical LAN to provide seamless Ethernet communication for roaming 802.11g/b Clients. In addition to greatly extending the Access Point canopy range, the Model 195Eg will also bridge any Ethernet device or Ethernet network connected to the unit over this same wireless Ethernet network. This mode gives the user the features of a point to multi-point bridge network but also allows 802.11g/b Client devices or the Model 195Eg in the Client mode to simultaneously roam under the network canopy.

5. **Self-Healing Mesh Network**. If multiple Access Point Repeater routes are configured to the same destination ESTeem, the 195Eg will create a "self-healing" mesh network by automatically re-routing data through alternate paths to reach its destination if the primary path is inoperable. The routing and priority of alternate paths is completely user configurable. See Figure 4.

Station (802.11g Client) Modes

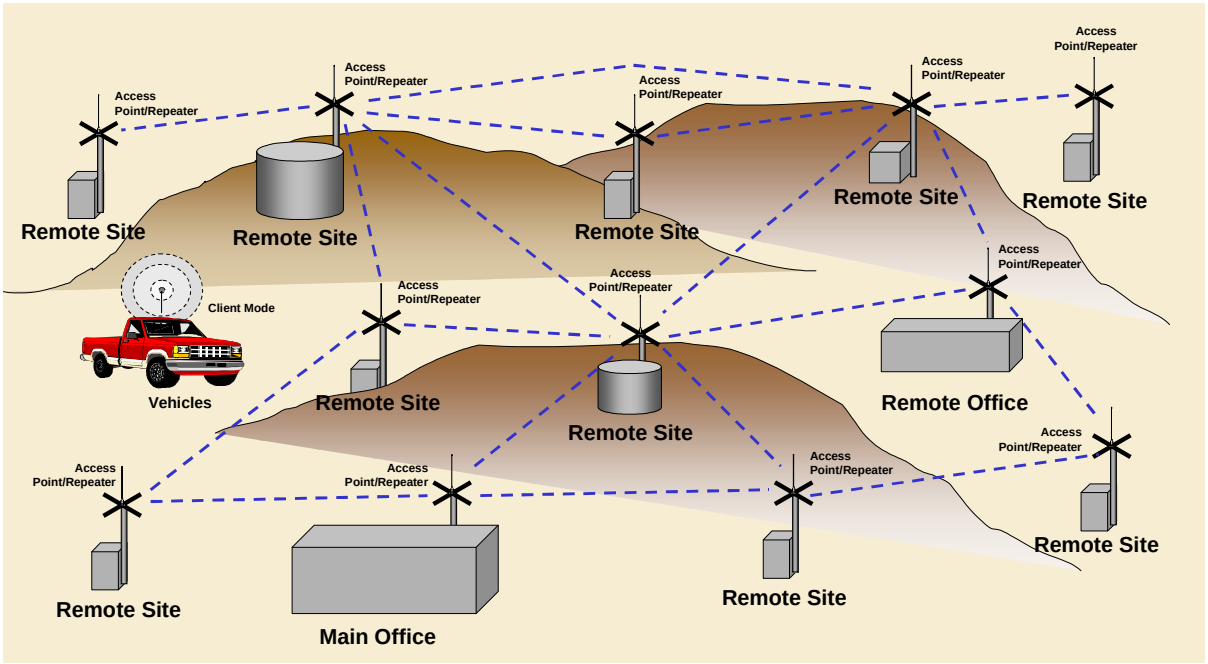


Figure 4 – Mesh Network Diagram

6. **EtherStation Mode**. This is a unique feature of the Model 195Eg when used in any Access Point network. When the 195Eg is configured in the EtherStation Mode and attached to a single Ethernet Device, the Model 195Eg will emulate an 802.11g PCMCIA wireless card in functionality for communication as an 802.11g client. The 195Eg will seamless roam under the radio canopy of Access Point and can provide greatly increased range over a Wireless LAN Card for mobile Ethernet devices such as vehicles, forklifts, cranes, etc (Figures 1-3).

7. **Station Router Mode**. The Station Router mode will also function as an 802.11g client, similar to EtherStation, but will allow multiple Ethernet devices to be connected to a single 195Eg (Figure 3). The 195Eg will function as a router between the wireless client mode and the wired Ethernet devices connected to the Ethernet port. Similar in configuration to the Access

Point Router mode, the wireless and wired Ethernet networks will need to be on separate subnets. To communicate from wireless network to devices on the wired Station Router network, a separate router (connected to the Ethernet side of the Access Point) is required. This mode would be used where multiple Ethernet devices will be connected to a single Model 195Eg in a mobile client application and the connected Ethernet devices will need to be accessible from the Access Point's LAN network.

8. **Station Masquerade Mode**. The Station Masquerade Mode is another mode where multiple devices will be connected to a single ESTeem in a mobile or Client application, but unlike the Station Router mode, the Station Masquerate will consolidate all connected Ethernet devices to a single IP address on the network. The devices connected to the Station Masquerade 195Eg will be able to access information from both the wireless and wired LAN, but will be inaccessible the other way similar in application to a firewall. This mode would be used where multiple Ethernet devices will be connected to a single Model 195Eg in a mobile application and the IP addresses for each device will be hidden from the LAN connected to the Access Point. See Figure 3.

9. **Serial Applications (Optional)**. The ESTeem 195Eg can optionally be installed with an RS-232 data port for serial data applications run over the broadband link (Figure 5). The serial over broadband network can be used in a point-to-point or point-to-multi-point application for networking serial (RS-232c) devices, providing serial connections to legacy hardware in a new Ethernet network or providing for high-bandwidth devices (such as Video or Voice over IP) in an existing serial network. Installing the serial port option also provides a second 10/100 Base-T Ethernet port that can be used to connect a second Ethernet device without requiring a HUB/Switch or can be configured as an external Router port.

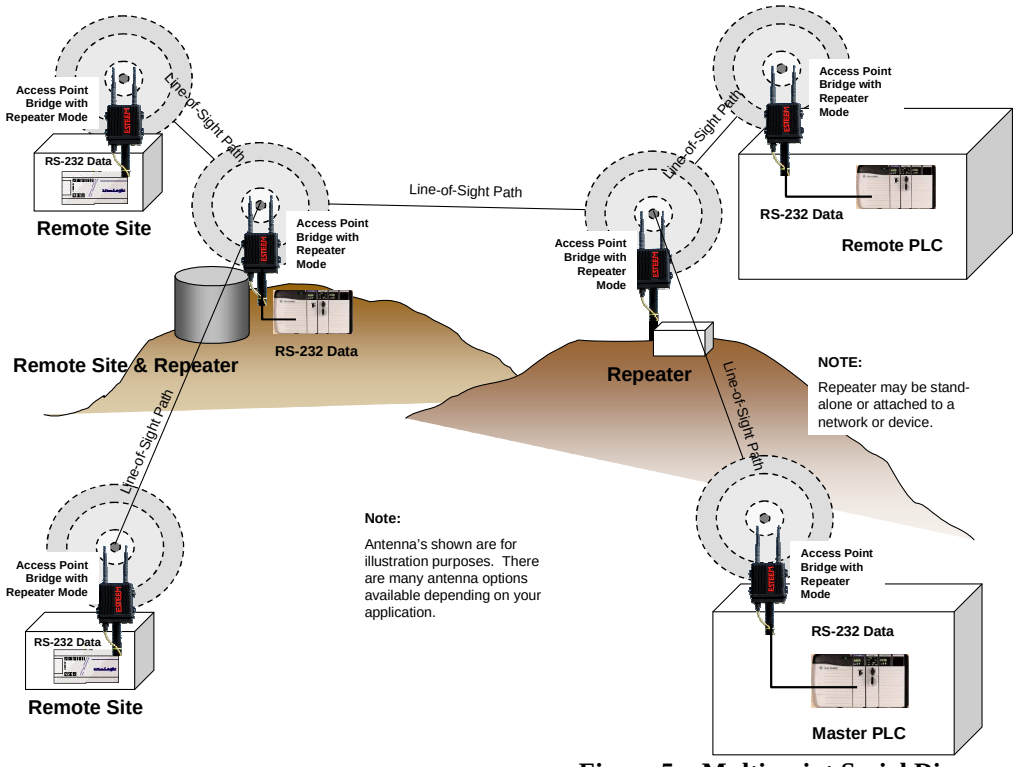


Figure 5 – Multi-point Serial Diagram

To begin setup of your wireless Ethernet network you must first configure the Model 195Eg for the mode desired. Chapter 2 will show several examples of the different modes of operation to help select the correct mode for your application.

MODEL 195Eg ACCESS POINT BRIDGE DIAGRAMS

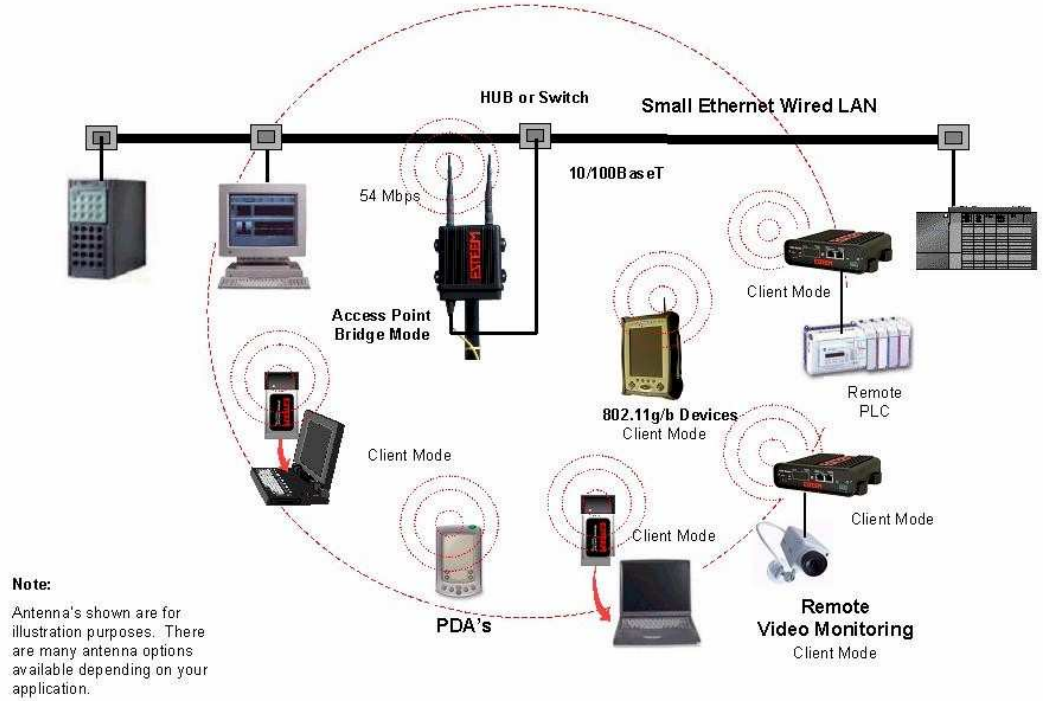


Figure 1: Single Access Point Bridge Diagram

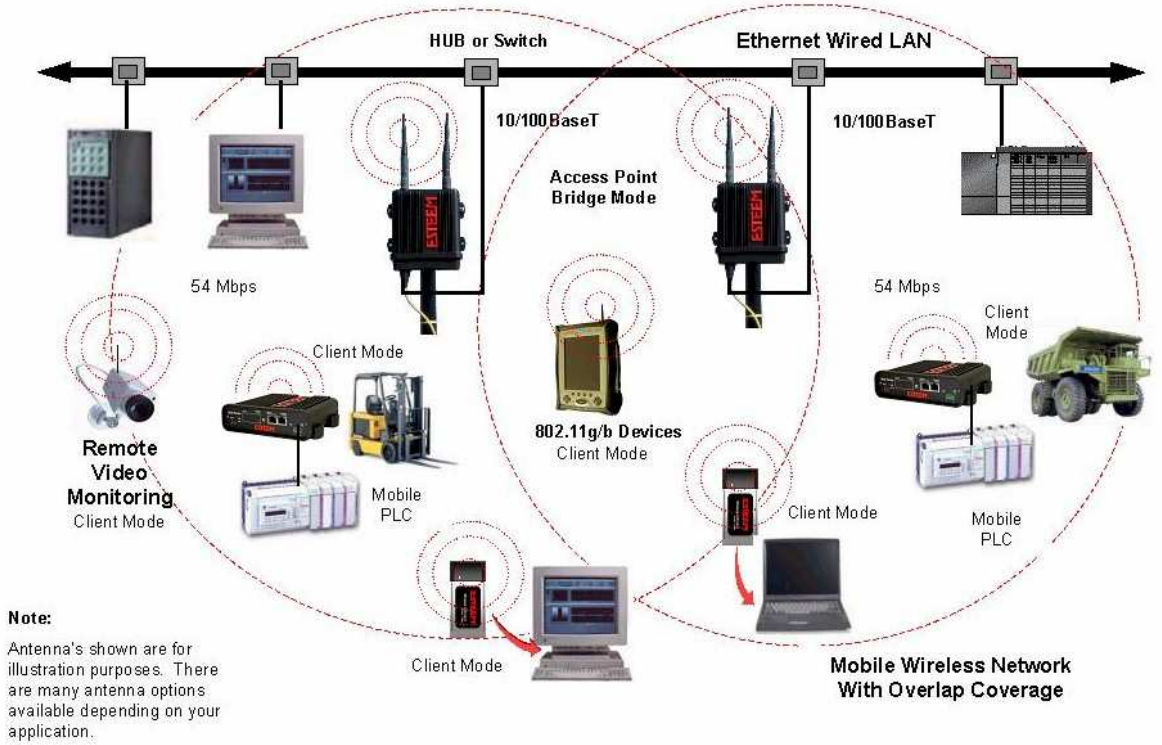


Figure 2: Multiple Access Point Bridge (Overlapping Coverage) Diagram

MODEL 195Eg ACCESS POINT ROUTER DIAGRAM

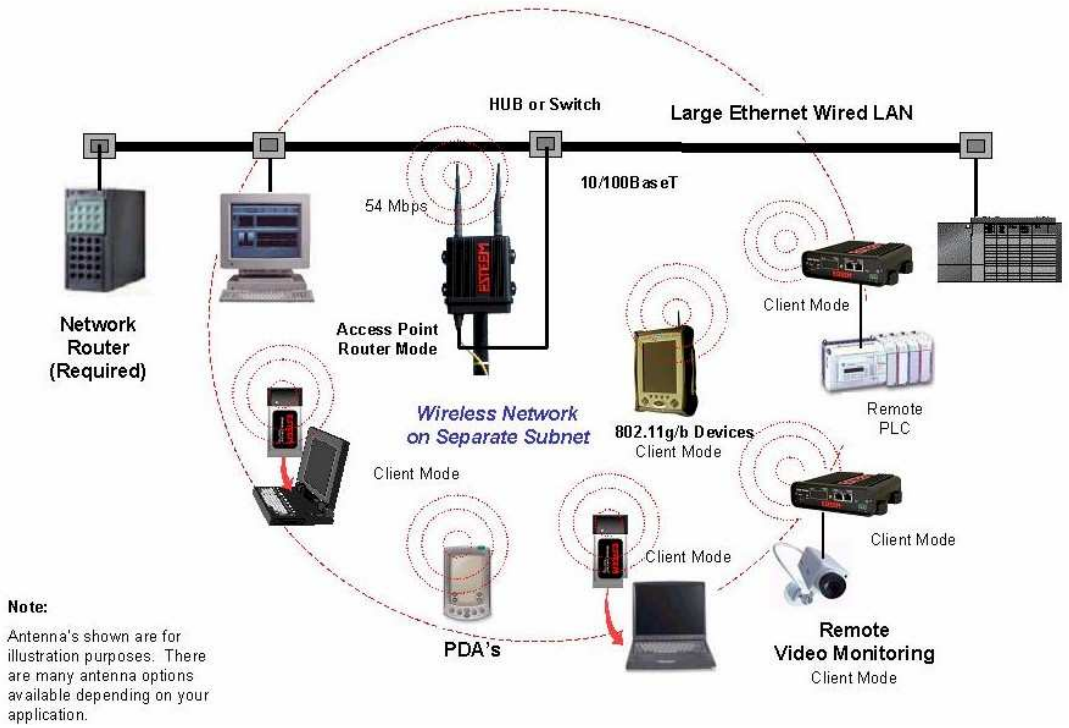


Figure 3: Access Point Router Diagram

MODEL 195Eg ACCESS POINT MASQUERADE DIAGRAM

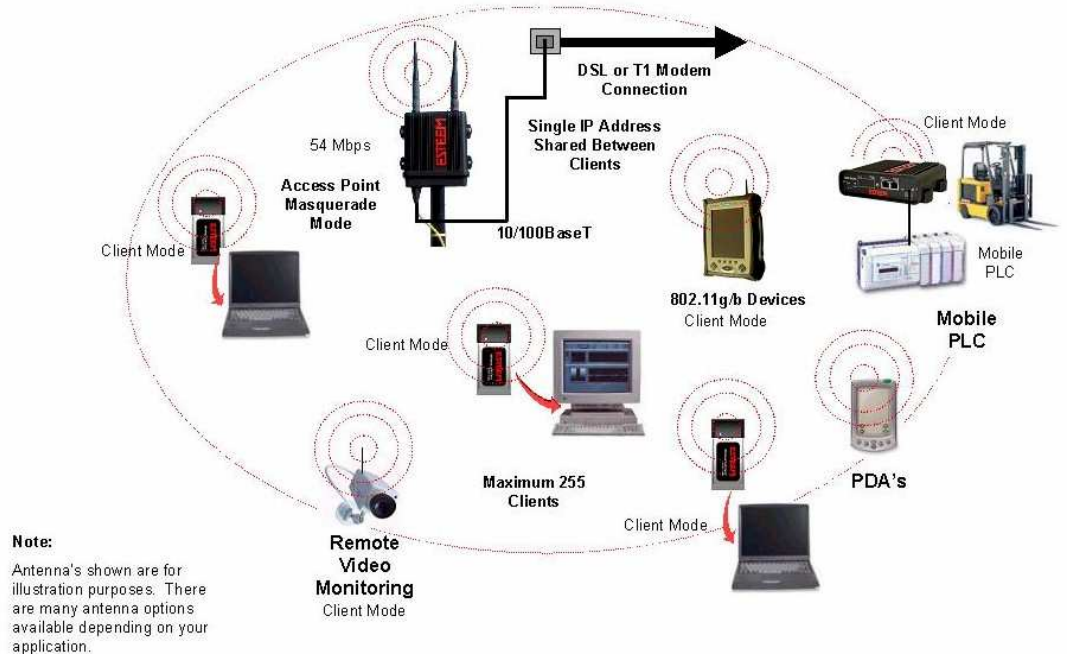


Figure 4: Access Point Masquerade Diagram

MODEL 195Eg ACCESS POINT REPEATER AND CLIENT CONFIGURATION DIAGRAMS

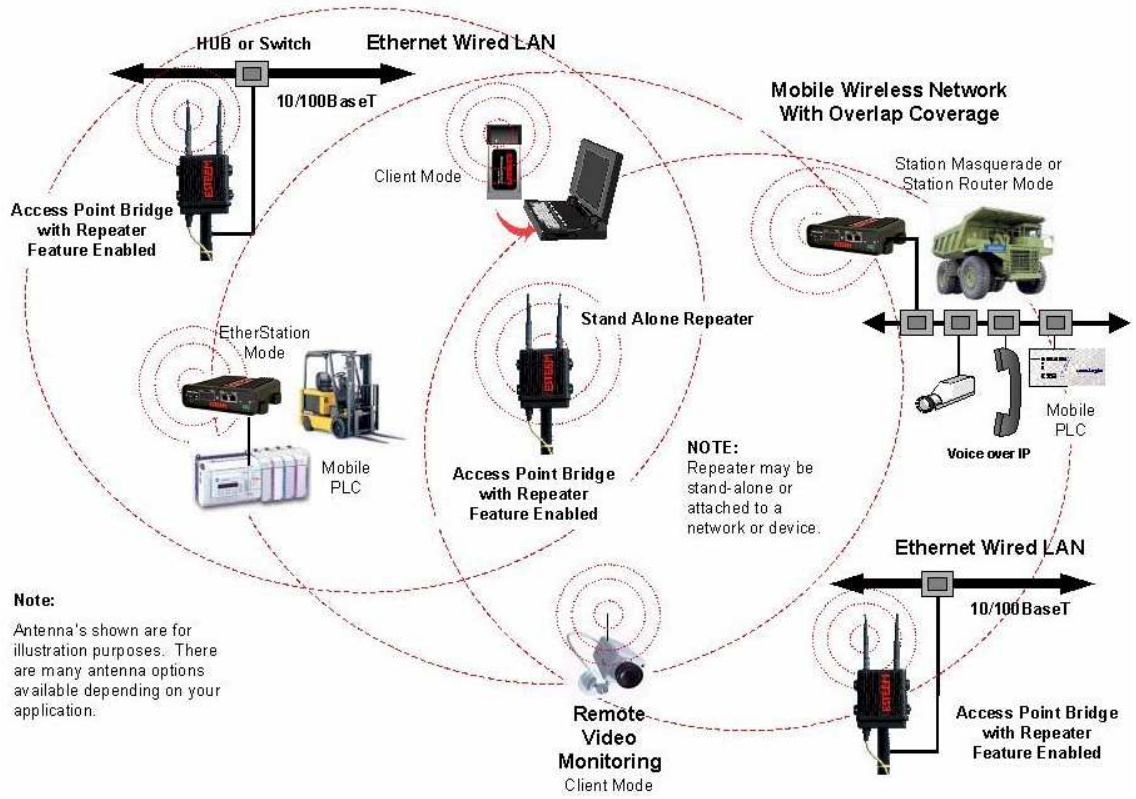


Figure 5: Access Point Bridge Repeater with Clients Diagram

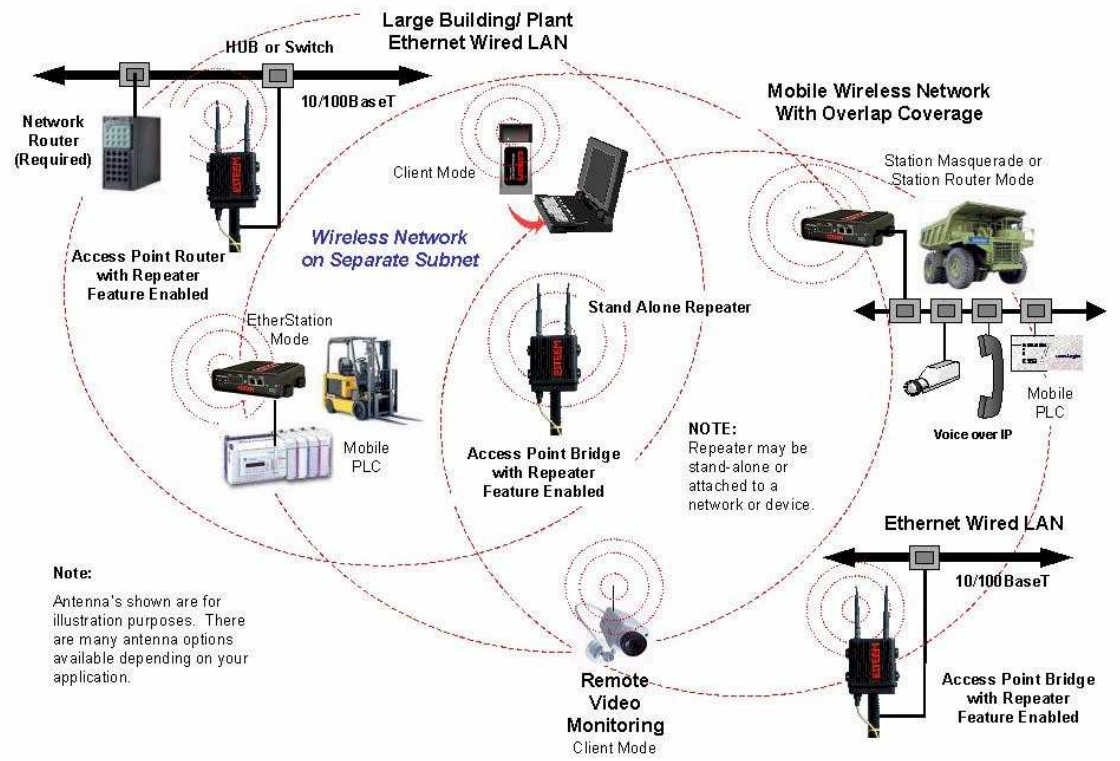


Figure 6: Access Point Router Repeater with Clients Diagram

MODEL 195Eg ACCESS POINT REPEATER AND CLIENT CONFIGURATION DIAGRAMS (Cont.)

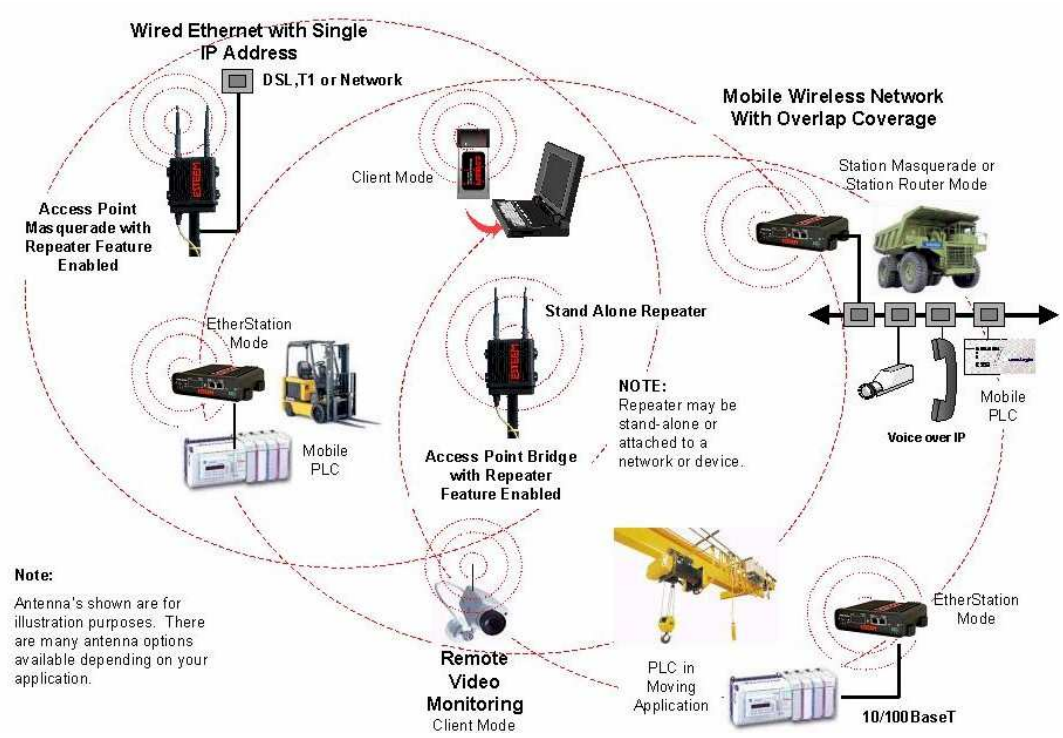

Wired Ethernet with Single IP Address
DSL,T1 or Network
Mobile Wireless Network With Overlap Coverage
Client Mode
Station Masquerade or Station Router Mode
Access Point Masquerade with Repeater Feature Enabled
Stand Alone Repeater
EtherStation Mode
NOTE:
Repeater may be stand-alone or attached to a network or device.
Mobile PLC
Voice over IP
Mobile PLC
Access Point Bridge with Repeater Feature Enabled
Note:
Antenna's shown are for illustration purposes. There are many antenna options available depending on your application.
Remote Video Monitoring Client Mode
PLC in Moving Application
EtherStation Mode
10/100BaseT

Figure 7: Access Point Masquerade Repeater with Clients Diagram

MODEL 195Eg BUILDING TO BUILDING CONFIGURATION DIAGRAMS

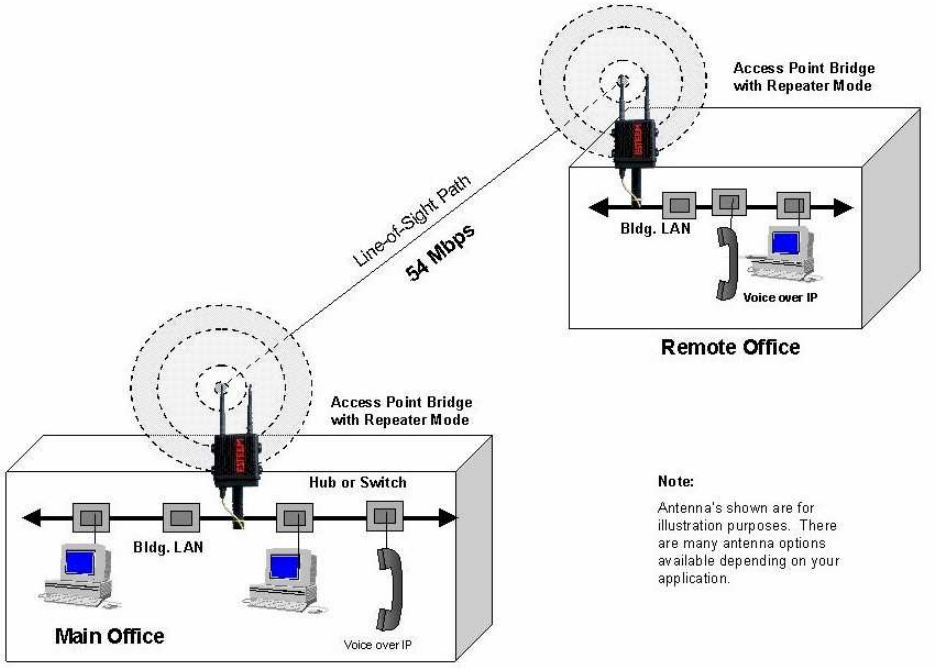


Figure 8: Building to Building Configuration Diagram

MODEL 195Eg BUILDING TO BUILDING CONFIGURATION DIAGRAMS (Cont.)

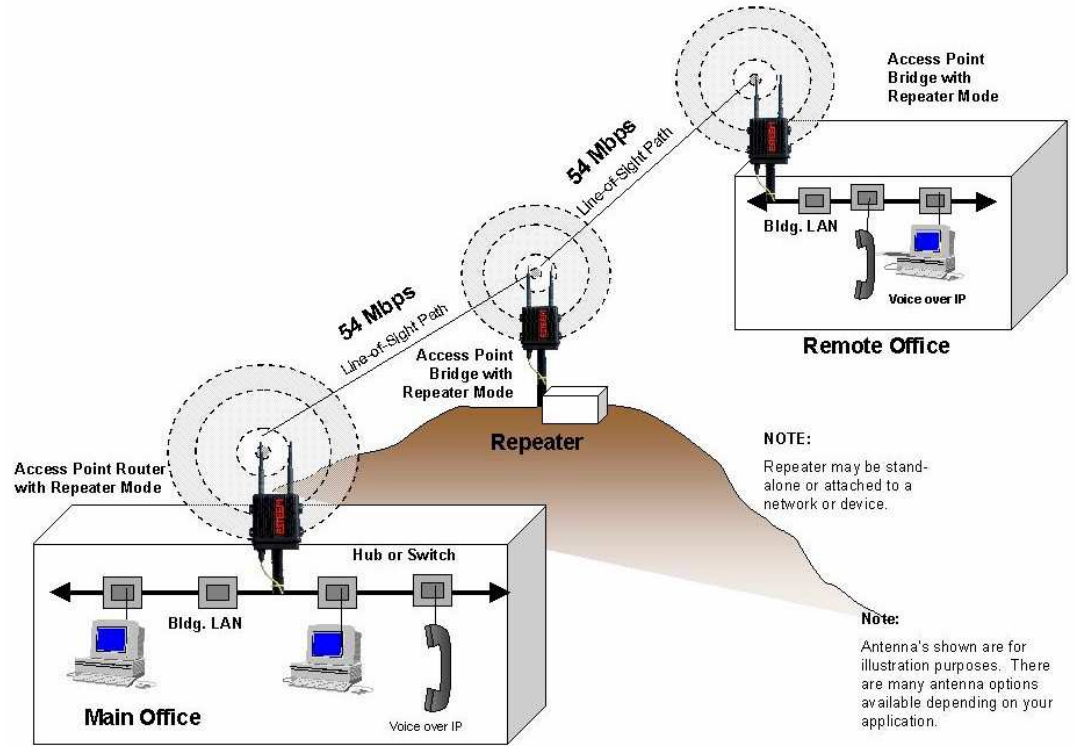


Figure 9: Building to Building with Repeater Diagram

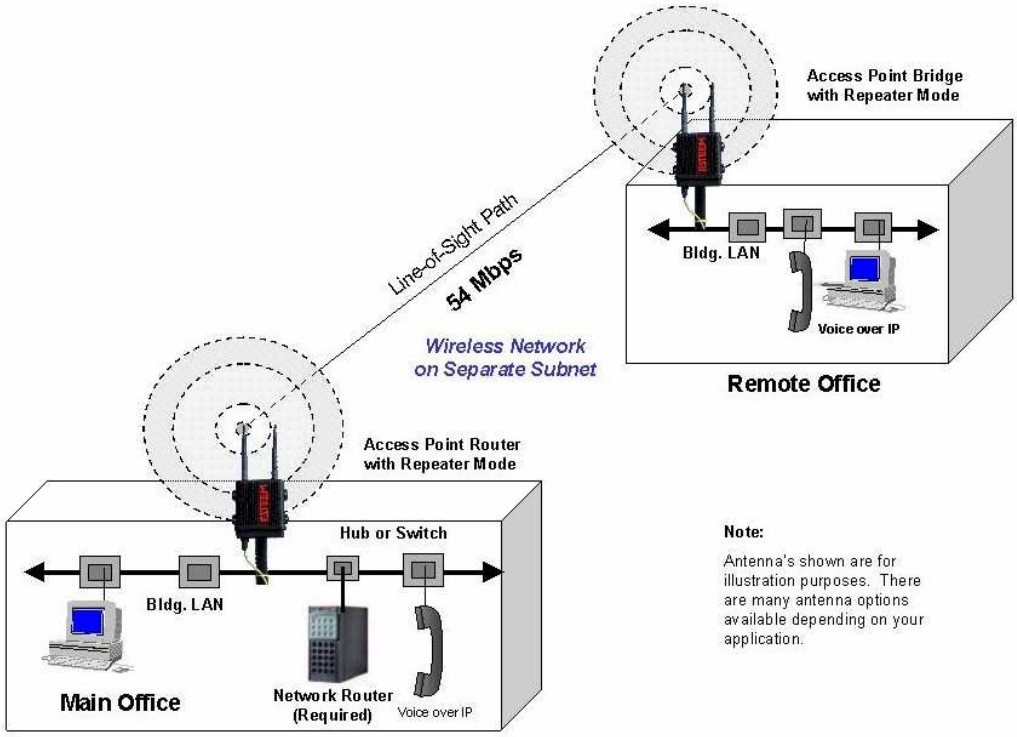


Figure 10: Building to Building Router Diagram

MODEL 195Eg COMPLETE BRIDGE SYSTEM CONFIGURATION DIAGRAMS

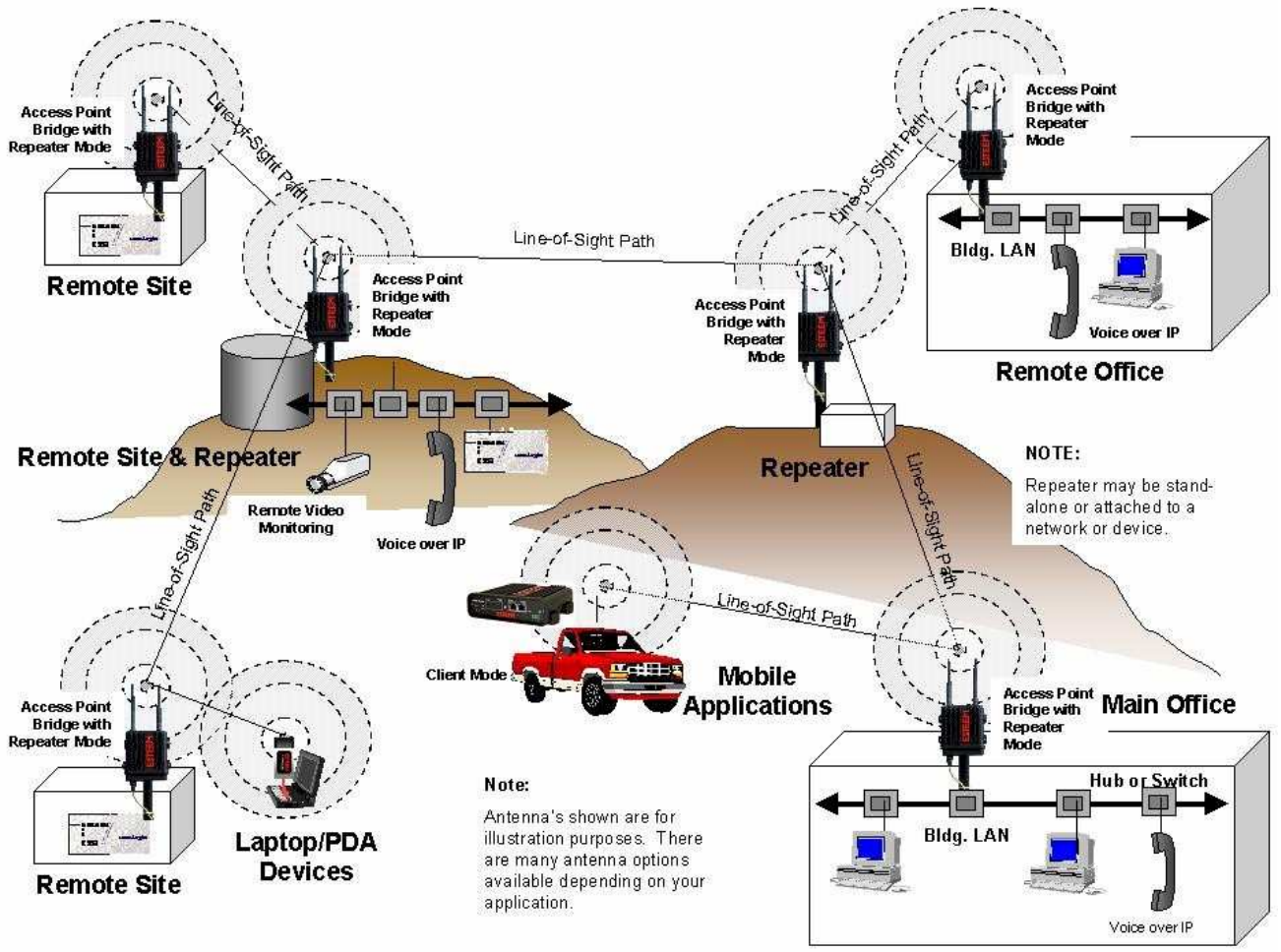


Figure 11: Complete Bridge Network Solutions Diagram

MODEL 195Eg COMPLETE ROUTER SYSTEM CONFIGURATION DIAGRAMS

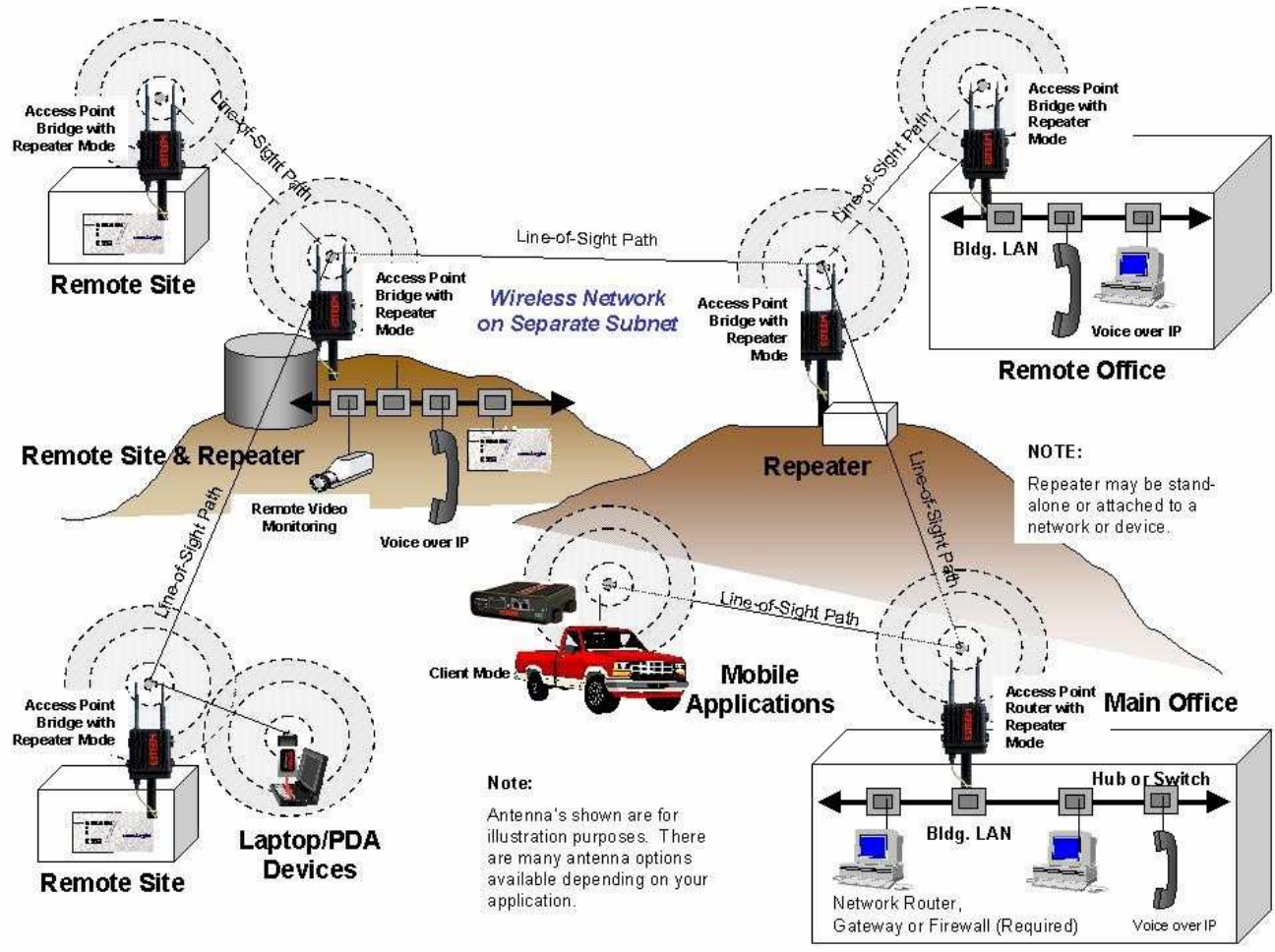


Figure 12: Complete Router Network Solutions Diagram

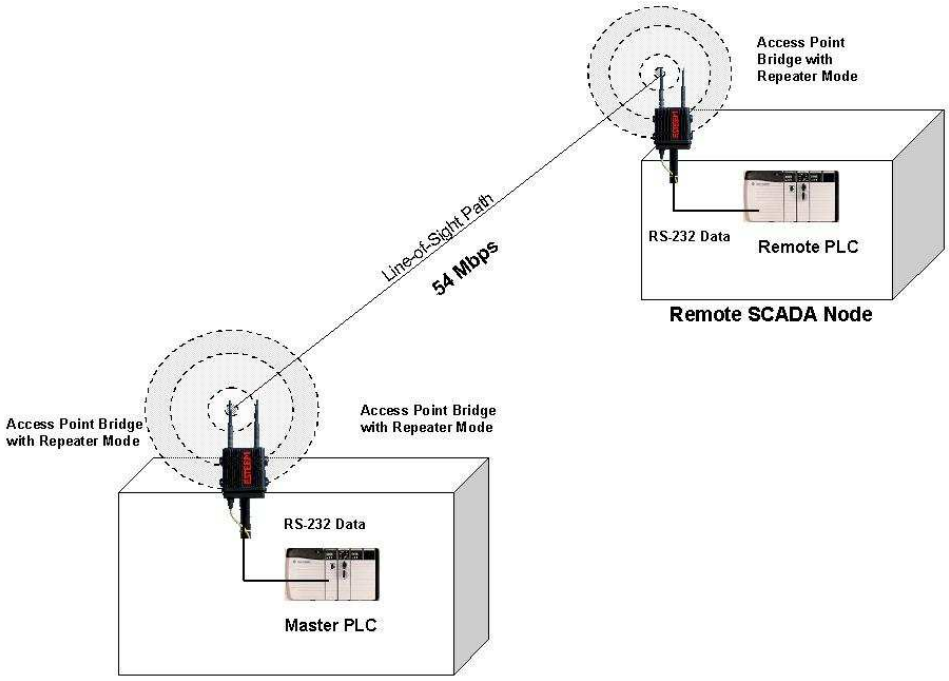


Figure 13: Point to Point Serial Diagram

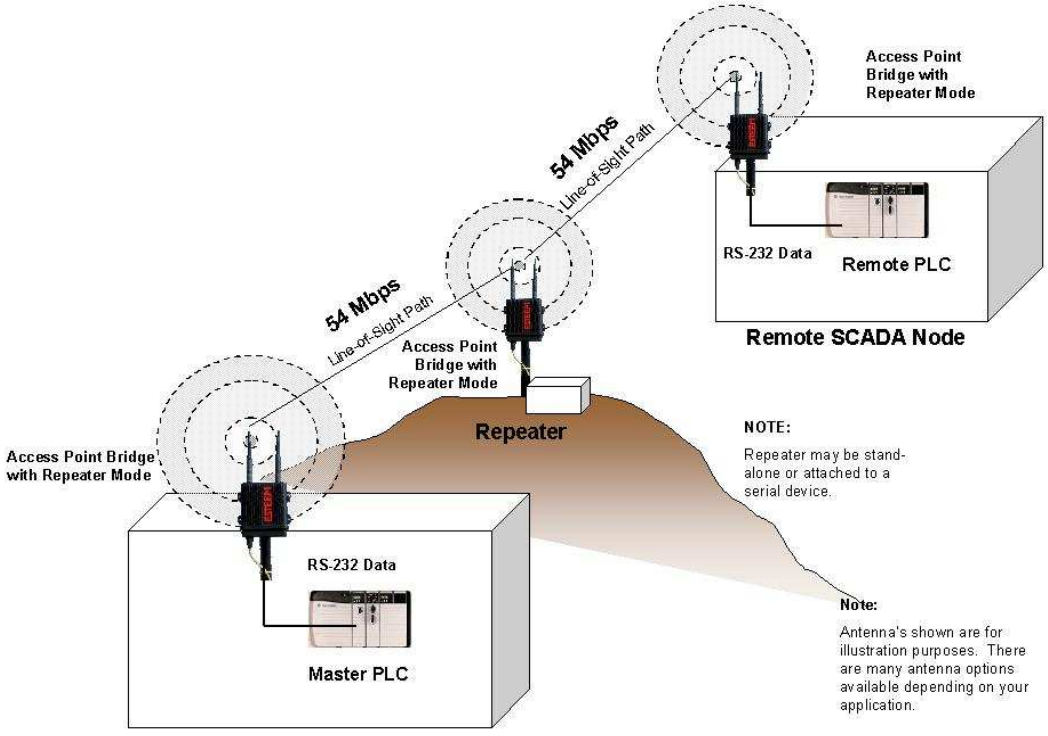


Figure 14: Point to Point With Repeater Serial Diagram

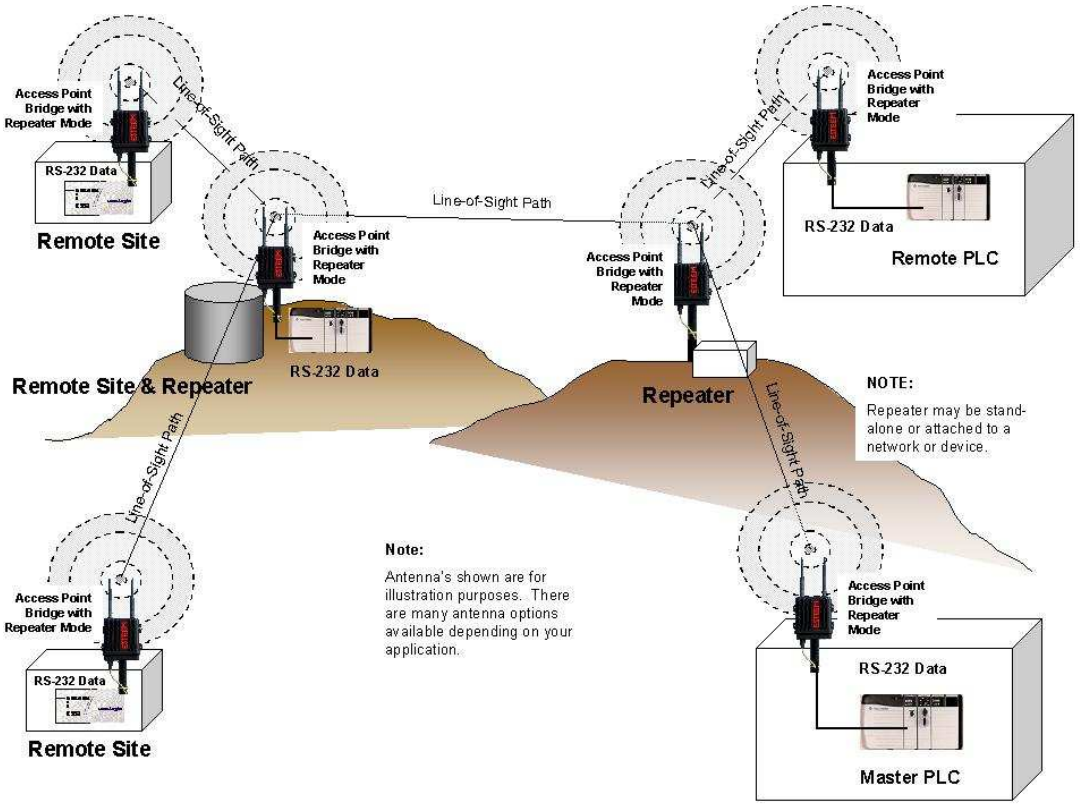


Figure 15: Multi-point Serial Diagram

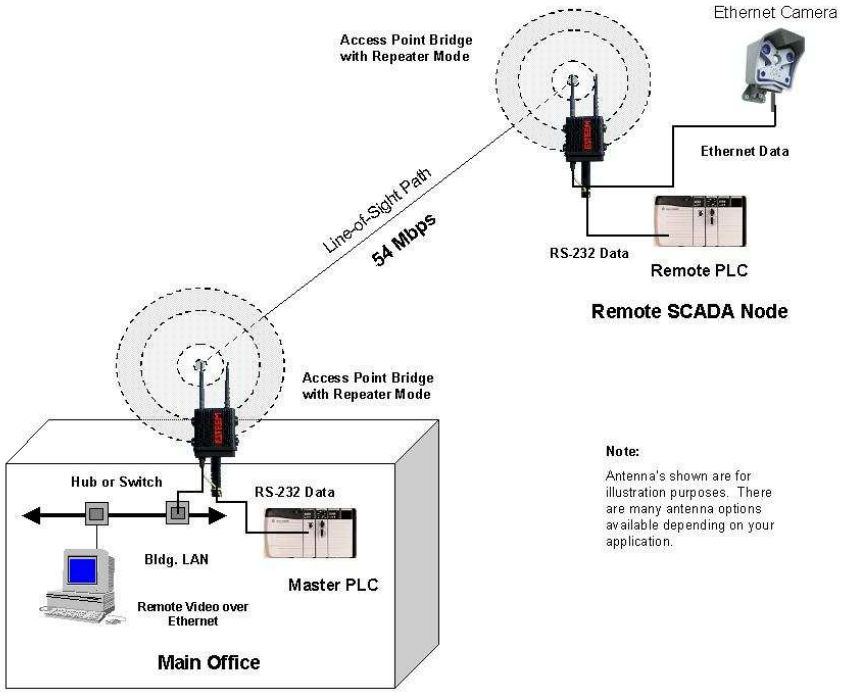


Figure 16: Ethernet and Serial Diagram

OVERVIEW

Most configuration of the ESTeem Model 195Eg is completed using the internal Web interface (discussed in detail in Chapter 4), but to access the modem through a web browser requires first setting the TCP/IP address. The TCP/IP address (IP address) is set at the factory for a static Class B (172.16.xxx.xxx - Mask 255.255.0.0) and listed on the ESTeem documentation. If this IP address does not match your network configuration, you will need to use either the ESTeem 195E Discovery program or the RS-232 interface to set the IP address in the 195Eg.

QUICK START GUIDE

A printed copy of the Model 195Eg Quick Start Guide was provided in the documentation package that arrived with your new ESTeem 195Eg. This guide is an abbreviated step-by-step procedure on configuration of the 195Eg for most Ethernet bridging and Access Point applications. A copy of the Quick Start Guide is provided in Appendix G of this User's Manual for convenience.

MODEL 195Eg HARDWARE LAYOUT

Unpack the ESTeem Model 195Eg shipping boxes and locate the items contained below for initial configuration. Take a few minutes to inventory your equipment before you proceed. Report any missing or damaged items to Customer Support (509-735-9092) as soon as possible.

Each node in your ESTeem Model 195Eg's network may have different hardware components based upon the final installation location (i.e Outdoor, Indoor, Point-to-point or Muti-Point). Antenna types, cable lengths, power supplies may be different, but the following items will be required for basic setup:

Model 195Eg

AA109 Resource Disk

Antenna (AA01S Displayed)

(2) Ethernet Cables

Power Supply (AA175 Displayed)

Serial Interface Cable (AA6021.1)

Note: *Your accessory model numbers may vary from the above, but you will need to locate each of above items to continue configuration.*

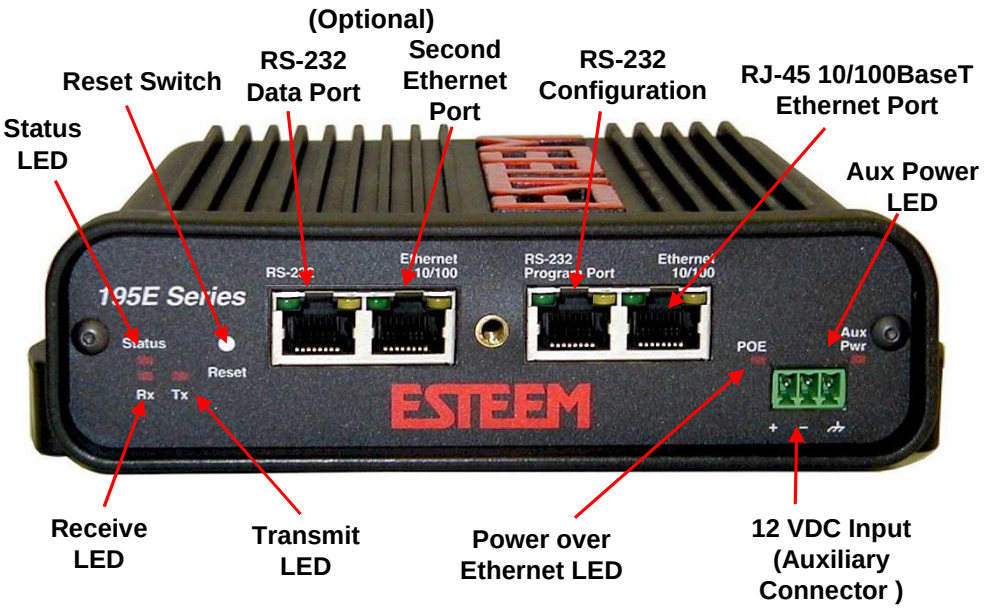


Figure 1: 195Eg Front Panel Overview

Notes:

- *There is no Power On/Off switch on the Model 195Eg.*
- *Attach the programming Cable to the RS-232 Programming Port and the Patch Cable between the Power Supply and Ethernet port.*
- *One word of caution, always attach an antenna to Port A (Figure 2) on the Model 195Eg before power up.*

Antenna Port A (Single Receive Antenna)

Antenna Port B (Dual Receive Antennas)

Antenna Connectors (TNC Female-RP)

Figure 2: 195Eg Antenna Overview

MODEL 195Eg HARDWARE CONFIGURATION

The following steps should be completed before any modifications are made to the IP address in the ESTeem Model 195Eg:

1. Connect the antenna to the antenna connector on the ESTeem Model 195Eg (Figure 3). For a single antenna use Antenna Port A and connect both if using dual antennas.

2. Assemble the 195Eg hardware as shown in Figure 4.

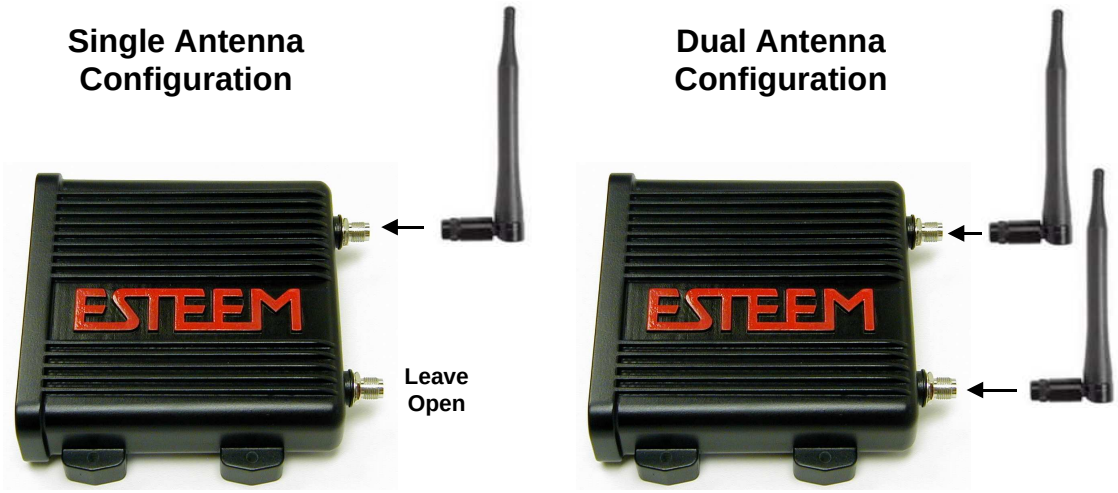
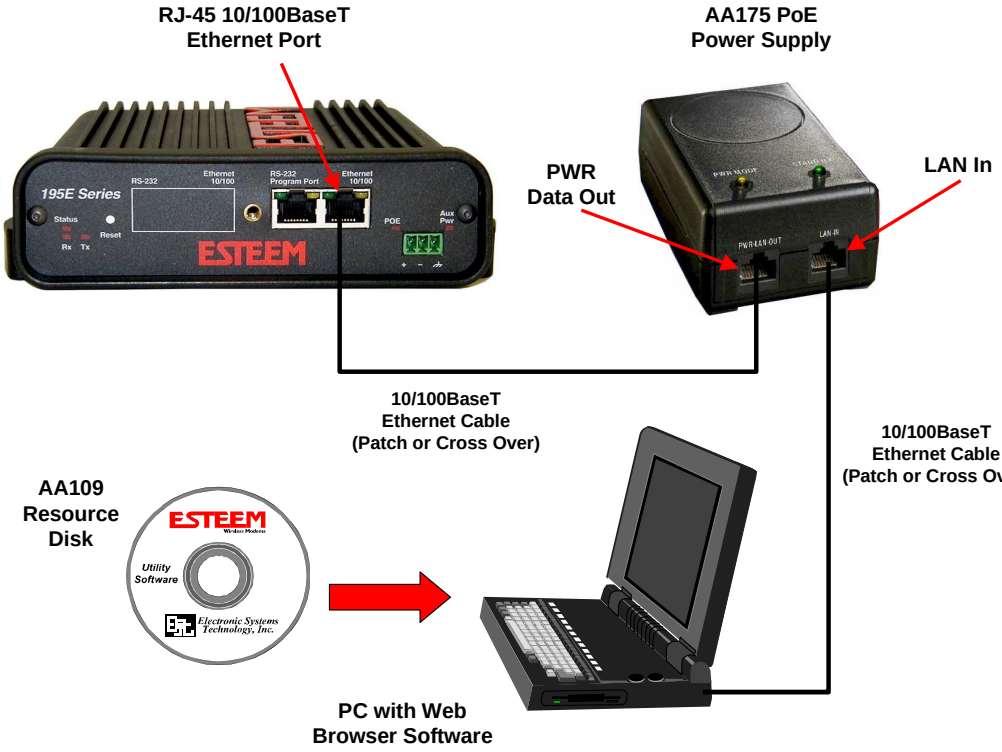


Figure 3: Antenna Configuration Diagram


RJ-45 10/100BaseT Ethernet Port
AA175 PoE Power Supply
PWR Data Out
LAN In
10/100BaseT Ethernet Cable (Patch or Cross Over)
10/100BaseT Ethernet Cable (Patch or Cross Over)
AA109 Resource Disk
Utility Software
PC with Web Browser Software

Notes:

- *Configure the Model 195Eg prior to mounting.*
- *Some of the following steps, such as connecting the serial cable, are easier to perform if the ESTeem is accessible.*
- *Please attach an antenna to the Model 195Eg before power up.*
- *There is no Power On/Off switch on the Model 195Eg.*

Figure 4: Hardware Configuration Diagram

3. Complete the following System Configuration Table. The Model 195Eg will link to other Model 195Eg's on the network via the WLAN Media Access Control (MAC) address found on the bottom of the case. This MAC address is six hexadecimal digits separated by colons and is configured at the factory. Every MAC address in the world is unique and can not be changed. Complete the following chart to aid in your when defining modes of operation and repeater routes.

Modem_ID(Name) /Operating Mode	Serial Number	IP Address	Ethernet MAC	WLAN MAC
Example Modem 1 AP_Bridge	E-14001	172.16.8.101	00:04:3f:00:01:01	00:04:3f:00:01:02

ESTEEM DISCOVERY UTILITY

The ESTeem Discovery Utility will allow you to configure the IP address on the Model 195Eg to match your network. Install the Discovery Utility on your computer by inserting the Resource Disk in your CD drive.

Note: The ESTeem Resource Disk is stand-alone copy of the ESTeem Web site (Figure 5). Navigation of the Resource Disk is as simple as using your web browser. All technical documentation, User's Manuals and the ESTeem Utility Program is available on the disk.

1. Place the ESTeem Utility CD in your CD-ROM drive. The CD will auto load the ESTeem main page

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Service:
Español
Contact Us
Home
Technical Support
ESTeem Utilities
Training
Technical Library
RF Design Program
ESTeem Home Page
ESTeem Wireless Modems manufacturers the complete line of ESTeem(TM) wireless products. The ESTeem Wireless Modems are available in High Speed Wireless Ethernet, Licensed Narrow Band Serial, and Unlicensed Spread Spectrum in the VHF and UHF radio communication bands.
The industry leader and patent holder on the wireless modem for over 20 years, EST has been providing the industrial control, public safety, and federal markets with proven and reliable wireless solutions. With our latest advancements to the ESTeem Wireless Ethernet line such as the Model 195Eg, the first 802.11g Wireless Ethernet radio built for the rigors of industrial use, we will again set the standard in the wireless industry!
News
Rockwell Automation
AUTOMATION FAIR
ESTeem Wireless Modems Debuts Latest Industrial Wireless Products >>
November 14, 2007
Automation Fair 2007, Chicago, IL — November 14, 2007 — Electronic Systems Technology, Inc. (EST) (OTC: ELST), dba ESTeem Wireless Modems, the manufacturer of the ESTeem

Figure 5: ESTeem Resource Main Page

Note: If the page does not auto load, open your web browser and set your address line to D:\index.html (Where D: is the drive letter for your CD-ROM drive).

2. From the Main Page select ESTeem Utilities and click on ESTeem Discovery Utility (Figure 6).

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Services
Español
Contact Us
Home
ESTeem Technical Support
ESTeem Utility Programs
Training
Technical Library
RF Design Program
Search:
Search
Entire Site
Get Adobe Reader
ESTeem Utility Programs
The following links require a Username and Password to download the Utilities. If you complete the registration form, a Username and Password will be sent to you the next business day or for immediate access, please contact Customer Support at 509-735-9092 (8AM-5PM PST Monday-Friday).
Each ESTeem Utility Program is in a compressed ZIP file. When asked to Open the File or Save to Disk, select Save to Disk. Place the file in its own directory on your hard drive, open the Zip file and run the executable program.
ESTeem Utility Features (Utilities)
Discovery Utility
The Discovery Utility will display all ESTeem 195Eg radio modems connected to the computer's Ethernet connection regardless of their current IP address. This utility will allow modification of the modem's IP address to the network of the computer for further configuration through a Web browser.
ESTeem Models 195Eg, 195Ep and 195Es
NOTE: Firmware version 302.7 Build: 42 or greater in the 195Eg is required.If installing an updated version of the Discovery Program, remove the older utility with the Control Panel>Add/Remove Programs prior to installing the new utility.
ESTeem Discovery Utility (Version 1.1.0.230) (Authorized Users)

Figure 6: Discovery Utility Download

Note: This program is saved in a compressed file format. Microsoft Windows XP® will open the file directly, but other operating systems will require a common compression program such as WinZip available for download at http://www.winzip.com

3. Double click on the 195EgiscoverySetup.exe file listed in the window to install the program.

4. Connect the Model 195Eg to your computer either direct to the Ethernet card or through a HUB/Switch using a CAT-5e Ethernet cable. The Ethernet port on the 195Eg supports Auto-Negotiation so either a patch cable or crossover cable will work. Open the ESTeem Discovery Program and press the Discover Modems button. The Model 195Eg will be displayed in the program by the Ethernet MAC address and Current IP Address (Figure 7).

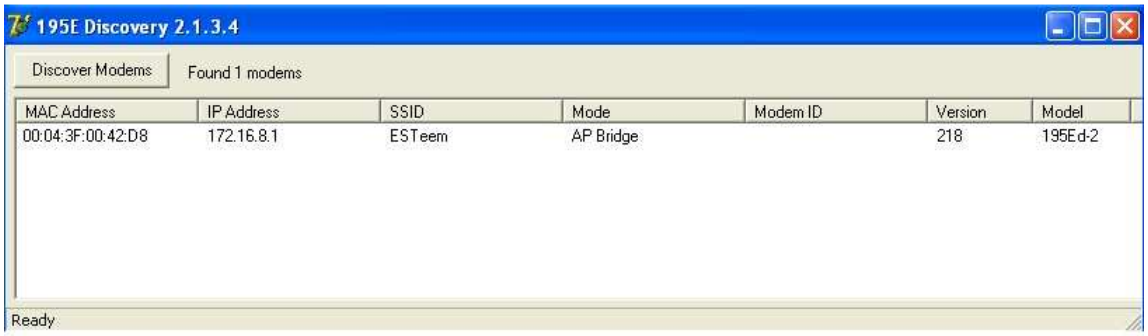


Figure 7: Discovery Program Main Page

Note: *The SSID and Mode of Operation will be adjusted later in the configuration.*

5. Double-click on the 195Eg you want to program and the *Configure IP Address* window will be displayed (Figure 8). Enter an IP address and Subnet Mask for the 195Eg that matches your network subnet and press the OK button to save this to the ESTeem. You will receive notification that the Configuration was Successful and the 195Eg will reboot. Proceed to ESTeem Setup in Chapter 4.

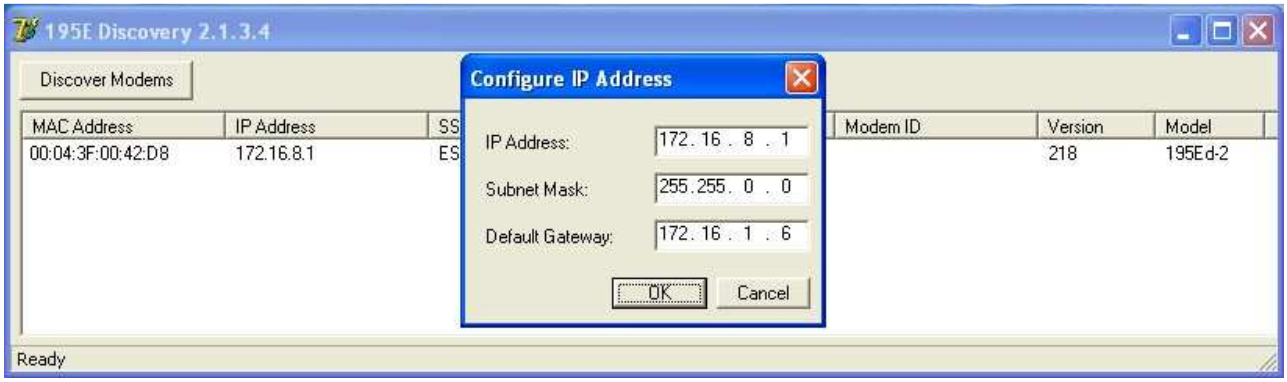


Figure 8: Change IP Address Window

USING THE RS-232 INTERFACE

Any terminal emulation program that can run with VT100 emulation can be used for this configuration of the ESTeem. Most Windows users will probably use either Hyper Terminal or the Terminal Emulation in the ESTeem Utility program. Configure your RS-232C port for a Baud Rate to 38,400, Data Bits to 8, Parity to None, Stop Bits to 1 and Handshaking to None and set the Emulation type to VT100. Once your ESTeem has an IP address, you can attach the ESTeem to your network and use the Web Server for further programming.

Programming Using the RS-232 Port

1. When configuring the Model 195Eg for the first time you can use the ESTeem RS-232C Configuration Menu to setup the basic operating parameters such as assigning the IP Address, IP Net Mask, and Gateway IP Address.

2. Connect the serial cable (EST P/N: AA0621.1) between the RS-232 connector (RJ-45) on the Model 195Eg's programming port to the serial port on the computer.

3. Any terminal emulation program can be used for the configuration of the Model 195Eg. Most users will use either the Terminal Emulation section of the ESTeem Utility Program or Hyper Terminal in Windows. Configure your RS-232C port for a Baud Rate to 38,400, Data Bits to 8, Parity to None, Stop Bits to 1, use No Handshaking (Flow Control) and set the Terminal to VT100 emulation.

4. Plug the Model AA175 power supply into a wall socket and connect an Ethernet patch cable from the Model 195Eg Ethernet port to the J1 (Data&PWR) port on the power supply (Figure 4). The Power over Ethernet (POE) LED on the front of the ESTeem should be illuminated.

5. If your computer is configured properly, you will see the ESTeem Model 195Eg booting sequence on your Terminal Emulation program. Once the ESTeem boot sequence is complete (approximately 45 seconds) you will receive this message:

   "Please press Enter to active this console."

   If you don't see this message press the Reset button on the front panel of the Model 195Eg and/or check the programming of your RS-232 port.

6. Press the Enter key and you will be at the Configuration Menu 195Eg login prompt. See Figure 9.

7. To enter the Model 195Eg Main Menu you will need to log into the system with a login name and password.

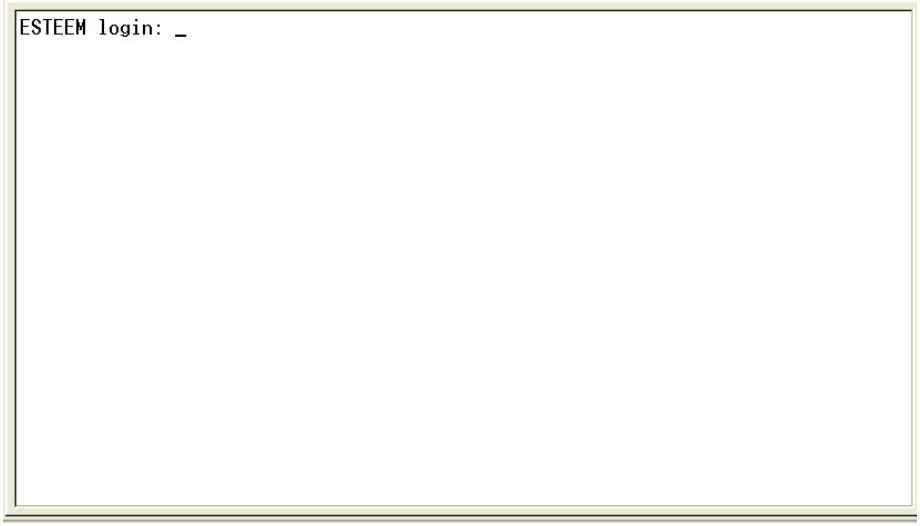


Figure 9: RS-232 Port Log-in Screen

8. If this is not the first time configuration of the Model 195Eg, see your network systems administrator for the password.

9. At the 195Eg login prompt type ***admin*** for the login name and press the ***Enter key*** (<Enter>). ***The login name is defined at the factory and is not changeable by the user.*** ***Note that all characters are lower case.***

10. If this is the first time the Model 195Eg has been programmed or the Password was not changed from the factory default values, the factory default password is also ***admin***. Enter ***admin*** for the password and press the Enter key (<Enter>).

    Note: All characters are lower case.

The ESTeem Configuration Welcome Screen (Figure 10) will now be displayed.

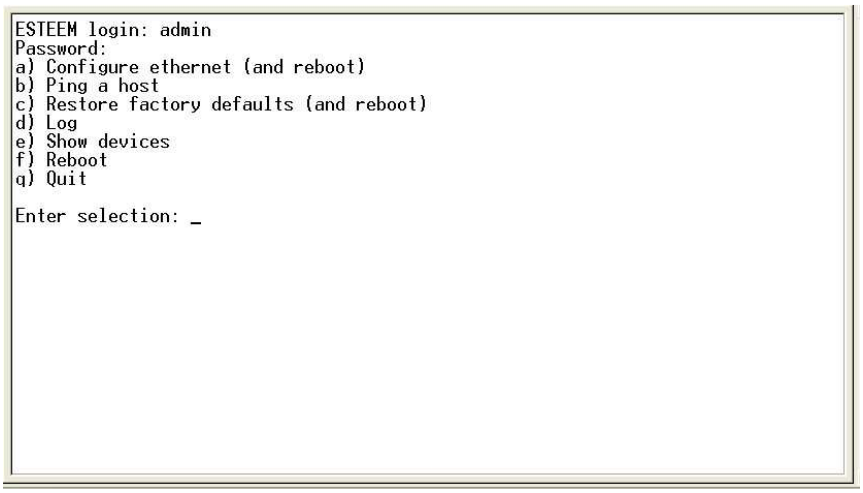


Figure 10: RS-232 Welcome Screen

11. To set the IP address in the ESTeem 195Eg, type the letter A and press the Enter key. Enter the value for the IP address, Netmask and default route and pressing the Enter key after each entry.

12. After the basic parameters have been entered into the Model 195Eg you will need to commit the changes to the Model 195Eg (Figure 11). Press the C key and then the Enter and the changes will be saved to flash memory. You can use programming features in the ESTeem Web Configuration Manager to configure the unit for your application. Proceed to Chapter 4.

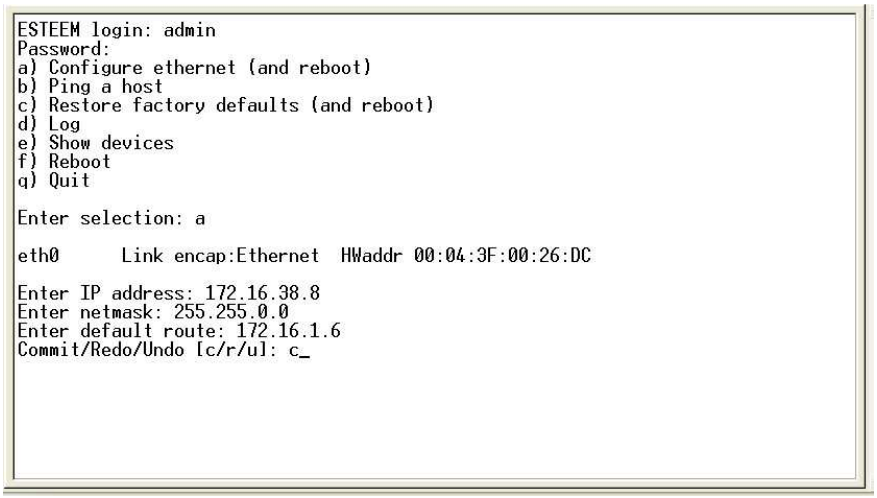


Figure 11: RS-232 Welcome Screen

11. The ESTeem Configuration Welcome Screen (Figure 11) will now be displayed. Press the Enter key to continue on the Top menu items.

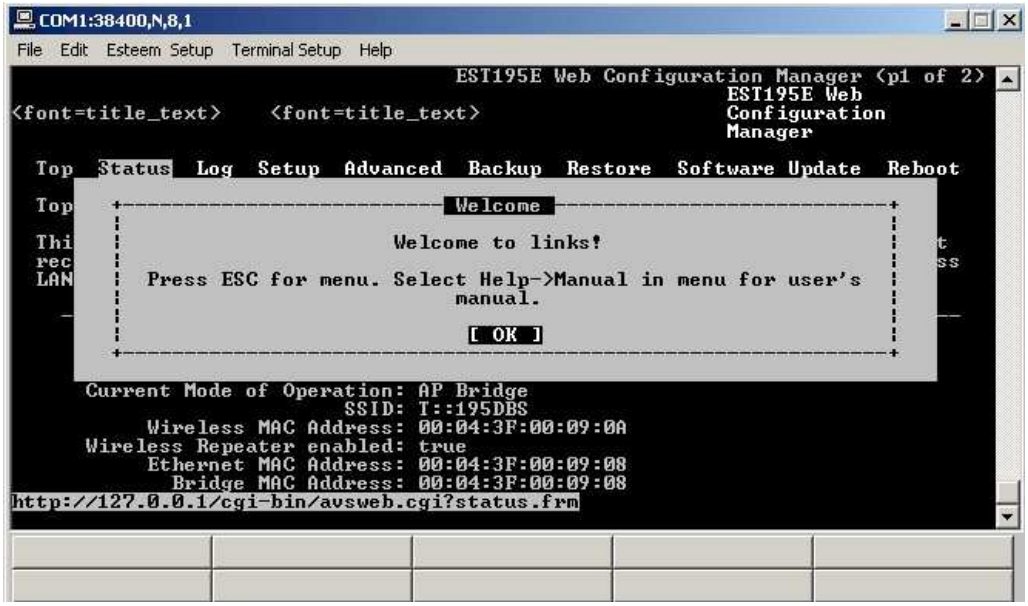

COM1:38400,N,8,1
File Edit Esteem Setup Terminal Setup Help
EST195E Web Configuration Manager (p1 of 2)
<font=title_text> <font=title_text>
EST195E Web Configuration Manager
Top Status Log Setup Advanced Backup Restore Software Update Reboot
Welcome
Welcome to links!
Press ESC for menu. Select Help->Manual in menu for user's manual.
[OK]
Current Mode of Operation: AP Bridge
SSID: T::195DBS
Wireless MAC Address: 00:04:3F:00:09:0A
Wireless Repeater enabled: true
Ethernet MAC Address: 00:04:3F:00:09:08
Bridge MAC Address: 00:04:3F:00:09:08
http://127.0.0.1/cgi-bin/avsweb.cgi?status.frm

Figure 11: RS-232 Welcome Screen

Note: ***The configuration menu functions the same as the Web Configuration Manager, but requires moving the arrows to change fields. To move left and right on the Menu Items use the Up and Down arrow keys and press Enter to select the highlighted item.***

12. Press the Down Arrow key until the SETUP menu item is highlighted and press Enter. Again press the Down Arrow key until the Mode of Operation is highlighted and press Enter again to bring up the mode selection menu (Figure 12).

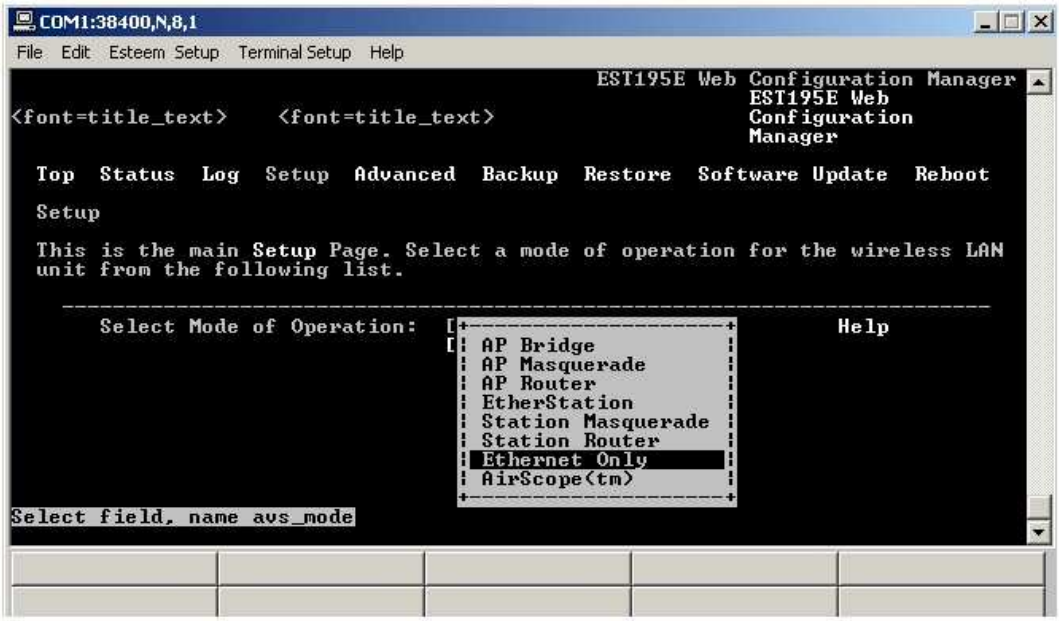


Figure 12: Setup Ethernet Only Screen

13. Select Ethernet Only and press the Enter key. In the initial configuration it is best not to use the ESTeem as a DHCP client. Select OFF on the DHCP client services on the next screen and continue the process selecting Next and Posting the information. Program the basic operating parameters such as assigning the Model 195Eg an IP Address, IP Net Mask, Gateway IP Address, Domain Name, or DNS IP Address.

Note: ***Next to all items in the configuration menu are Help screens that define all the settings and provide assistance on configuring the Model 195Eg.***

14. After the basic parameters have been entered into the Model 195Eg you will need to commit the changes to the Model 195Eg (Figure 13). The changes will be saved to flash memory. You can use programming features in the ESTeem Web Configuration Manager to configure the unit for your application. Proceed to Chapter 4.

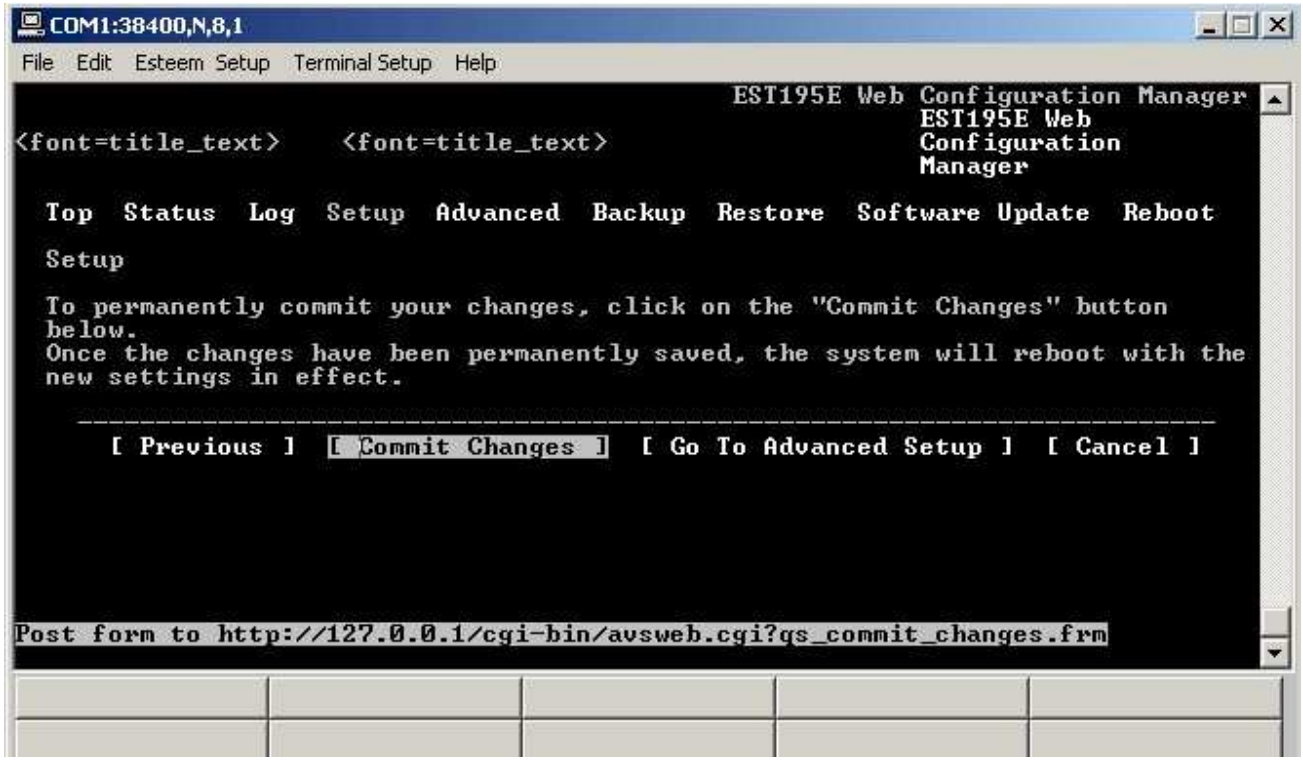

COM1:38400,N,8,1
File Edit Esteem Setup Terminal Setup Help
EST195E Web Configuration Manager
<font=title_text> <font=title_text>
EST195E Web Configuration Manager
Top Status Log Setup Advanced Backup Restore Software Update Reboot
Setup
To permanently commit your changes, click on the "Commit Changes" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
[Previous] [Commit Changes] [Go To Advanced Setup] [Cancel]
Post form to http://127.0.0.1/cgi-bin/avsweb.cgi?qs_commit_changes.frm

Figure 13: Commit Changes Screen

CHAPTER 4
WEB CONFIGURATION

The ESTeem Model 195Eg Web Configuration Manager is an internal web server that will allow setup, monitoring and diagnostics of all operating parameters in the Model 195Eg. The 195Eg can be configured using any current web browser software such as Internet Explorer, Netscape or Mozilla.

LOGGING ON TO THE ESTeem WEB PAGE

1. Using your Web Browser connect to the Model 195Eg Web Page with the IP Address that you have assigned it in Chapter 3.

2. You will now see the Log-on Menu on Figure 1. To enter the Model 195Eg Top Menu you will need to log into the system with a User Name and Password.

3. For the User Name enter **admin** and press the Enter key (<Enter>). The User Name is defined at the factory and is not changeable.

4. Enter your Password and press the Enter key (<Enter>).

Figure 1: ESTeem Web Page Log-on Screen

If this is the first time the Model 195Eg has been programmed and Password was not changed from the factory default values, proceed with the steps below to access the Configuration Menu.

- ***The factory default Password is also admin. Enter admin for the Password and press the Enter key (<Enter>).***
- ***Note: All characters are lower case.***

5. After Log-in the next screen displayed will be the Model 195Eg Top Menu page (Figure 2). This example screen shows the Top Menu screen.

Note: Throughout the Configuration Manager are Help Screens that can accessed for further information on each item.

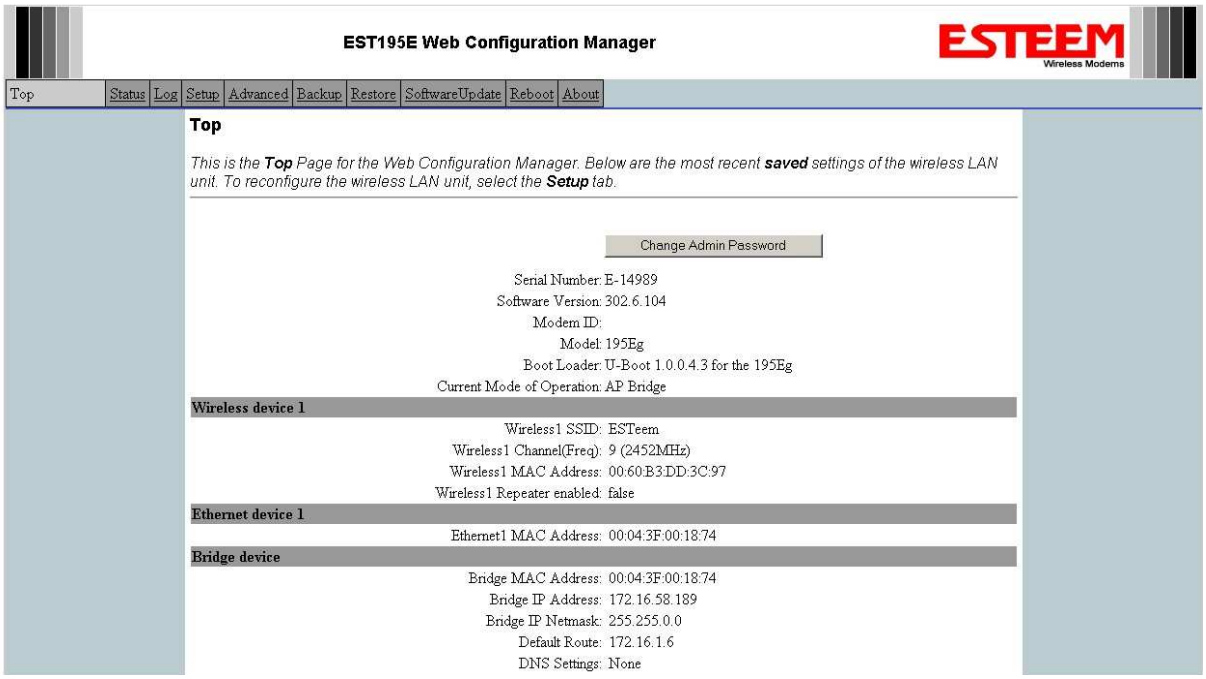


Figure 2: Top Menu Screen

WEB CONFIGURATION MANAGER SECTIONS

The following sections will describe the features in each of the main and sub menu items in the web pages. For step-by-step examples of how to configure the Model 195Eg in different Modes of Operation, please refer to Chapter 5 – Example Configurations.

Top Menu

The Top Menu will be the default web page for the Model 195Eg Web Configuration Manager (Figure 2). This section will display the current configuration summary for the Model 195Eg and allow changing of the default password. This page will also display the Modem ID field that can be used to easily identify the 195Eg you are programming. This Modem ID field can be set to any text combination for example, location name, GPS coordinates or addresses.

Setting the Modem ID

1. The Modem ID field can be adjusted under the *Global Variables* of the Advanced Menu tab. Select Global Variables and press the *Next* button. Figure 3 will be displayed.

2. Scroll to the bottom of the Global Variables window and enter the text you would like displayed in the Modem ID field (Figure 4). When complete, press the *Save Settings* button and the *Commit Changes* button on the next screen to save the name to the 195Eg.

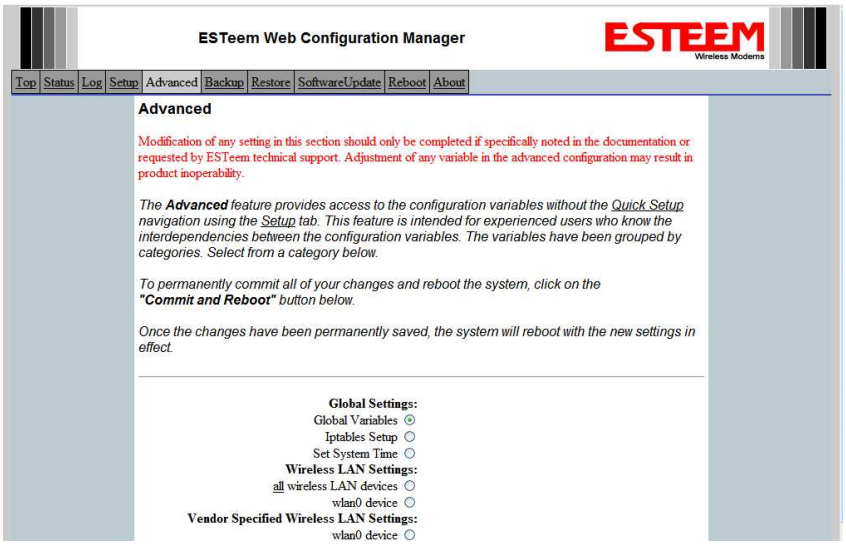

ESTeem Web Configuration Manager
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device

Figure 3: Global Variables Screen

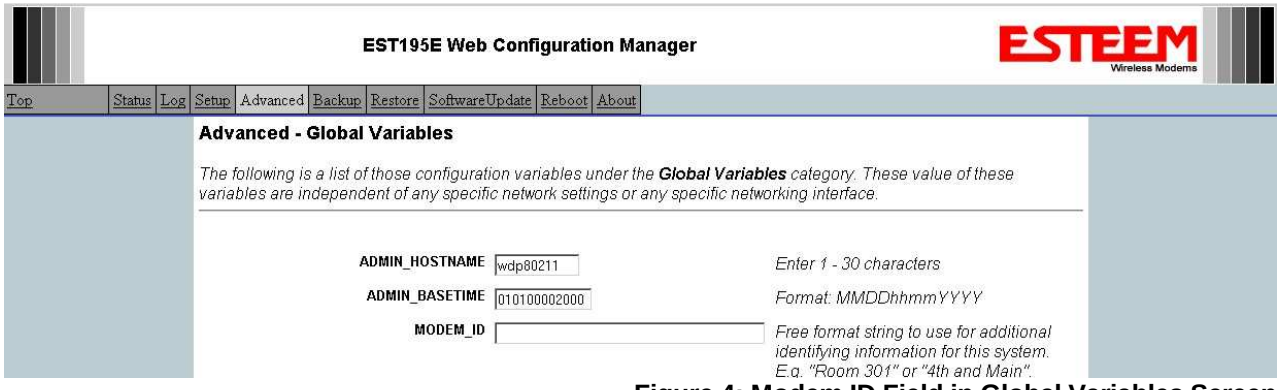


Figure 4: Modem ID Field in Global Variables Screen

Status Menu

The Status Menu provides a summary of the current mode of operation, system time, processor usage, internal temperature and status of the communication links to other wireless devices. An example is shown below in Figure 5. Most of the communication troubleshooting is done in this section of the Web Configuration Manager.

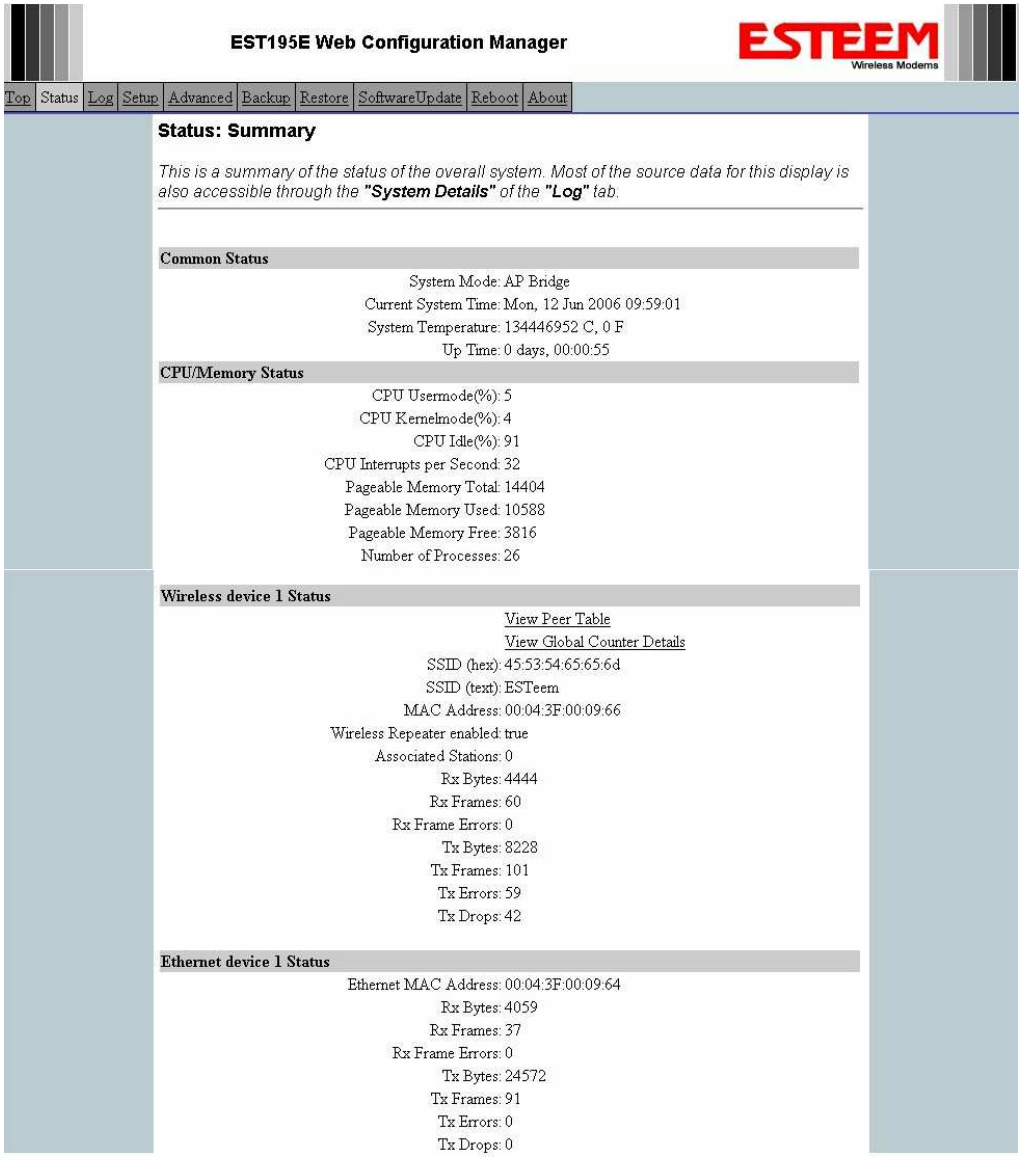

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Status: Summary
This is a summary of the status of the overall system. Most of the source data for this display is also accessible through the "System Details" of the "Log" tab.
Common Status
System Mode: AP Bridge
Current System Time: Mon, 12 Jun 2006 09:59:01
System Temperature: 134446952 C, 0 F
Up Time: 0 days, 00:00:55
CPU/Memory Status
CPU Usermode(%): 5
CPU Kernelmode(%): 4
CPU Idle(%): 91
CPU Interrupts per Second: 32
Pageable Memory Total: 14404
Pageable Memory Used: 10588
Pageable Memory Free: 3816
Number of Processes: 26
Wireless device 1 Status
View Peer Table
View Global Counter Details
SSID (hex): 45:53:54:65:65:6d
SSID (text): ESTeem
MAC Address: 00:04:3F:00:09:66
Wireless Repeater enabled: true
Associated Stations: 0
Rx Bytes: 4444
Rx Frames: 60
Rx Frame Errors: 0
Tx Bytes: 8228
Tx Frames: 101
Tx Errors: 59
Tx Drops: 42
Ethernet device 1 Status
Ethernet MAC Address: 00:04:3F:00:09:64
Rx Bytes: 4059
Rx Frames: 37
Rx Frame Errors: 0
Tx Bytes: 24572
Tx Frames: 91
Tx Errors: 0
Tx Drops: 0

Figure 5: Status Screen

Peer Status Table

The Peer Status submenu lists the connected wireless devices (either Model 195Egs or 802.11g/b clients), their signal strength, data rate and time of last packet sent. Press the View Peer Table link and Repeater Peer Status Table will be displayed (Figure 6). For a detailed analysis of the information provided in this table, please review Appendix F – Troubleshooting.

Associated Station – This section will list all the associated stations that are attached to the Access Point. These could be other Model 195Eg's in one of the three Client modes or 802.11g/b devices.

Repeater Peers – This section will list all connected 195Eg repeater peers by their Wireless MAC address. For detailed information on repeaters, see Chapter 6 – Repeating Features.

Access Points – This section will list all other 802.11g or 802.11b Access Points that are sharing the operating channel (frequency) of the 195Eg. You can also note that the Repeater Peers listed above are also included in this list.

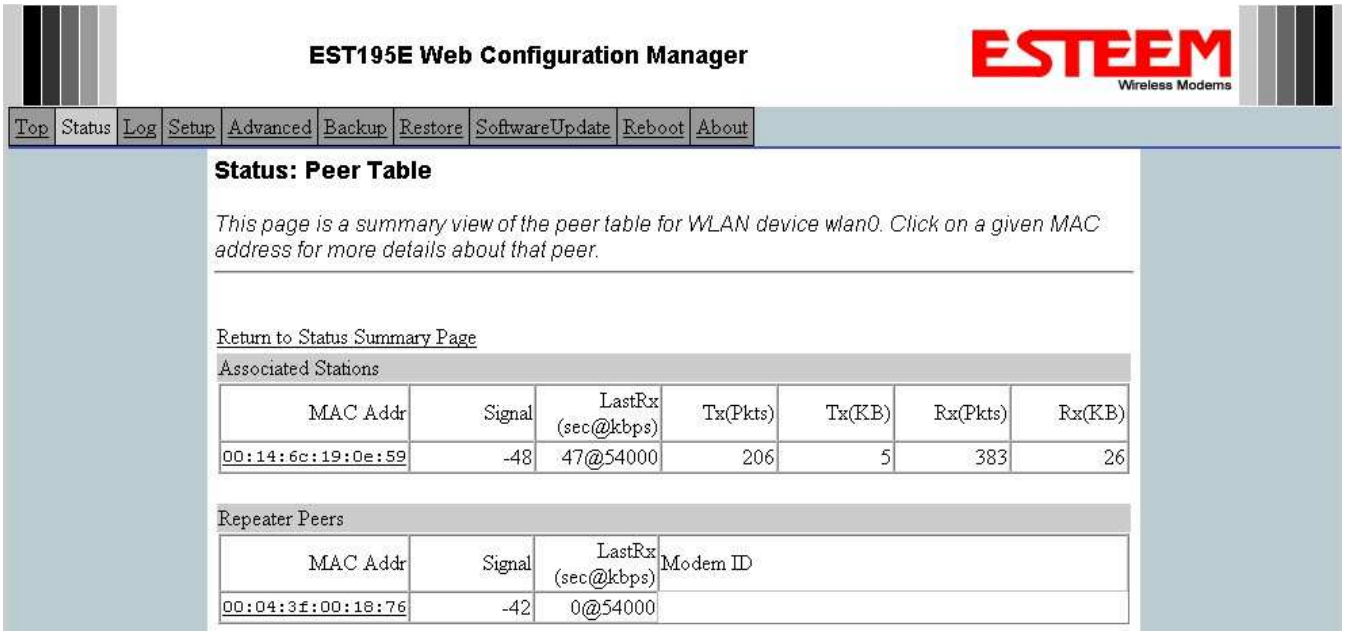


Figure 6: Peer Table Screen

Counter Details

The Counter Details submenu will summarize all transmitted and receive data packets for the Model 195Eg (Figure 5).

System Log Screen

The Log Screen is a trouble-shooting tool that shows the current log of Model 195Eg system messages. See Figure 7. The System Details button will display a more detailed system diagnostics that may be requested by ESTeem technical support.

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
System Log
The following display is the system log. To view more detailed system information, click on the System Details button.
System Details
System Log:
Jan 1 00:00:00 (none) syslog.info syslogd started: BusyBox v1.00 (2006.05.22-22:27+0000)
Jan 1 00:00:01 (none) kern.notice kernel: klogd started: BusyBox v1.00 (2006.05.22-22:27+0000)
Jan 1 00:00:01 (none) kern.warn kernel: Linux version 2.4.27 (tbrown@brown) (gcc version 3.4.3) #10 Wed May 31 14:35:43 PD
Jan 1 00:00:01 (none) kern.warn kernel: Early serial init of port 0
Jan 1 00:00:01 (none) kern.warn kernel: Early serial init of port 1
Jan 1 00:00:01 (none) kern.warn kernel: Esteem 195CPU (C) 2004 Electronic Systems Technology.
Jan 1 00:00:01 (none) kern.warn kernel: On node 0 totalpages: 4096
Jan 1 00:00:01 (none) kern.warn kernel: zone(0): 4096 pages.
Jan 1 00:00:01 (none) kern.warn kernel: zone(1): 0 pages.
Jan 1 00:00:01 (none) kern.warn kernel: zone(2): 0 pages.
Jan 1 00:00:01 (none) kern.warn kernel: Kernel command line: root=/dev/mtdblock3 ro console=ttyS0,38400
Jan 1 00:00:01 (none) kern.warn kernel: Calibrating delay loop... 249.03 BogoMIPS
Jan 1 00:00:01 (none) kern.info kernel: Memory: 14320k available (1392k kernel code, 372k data, 84k init, 0k highmem)
Jan 1 00:00:01 (none) kern.info kernel: Dentry cache hash table entries: 2048 (order: 2, 16384 bytes)
Jan 1 00:00:01 (none) kern.info kernel: Inode cache hash table entries: 1024 (order: 1, 8192 bytes)
Jan 1 00:00:01 (none) kern.info kernel: Mount cache hash table entries: 512 (order: 0, 4096 bytes)

Figure 7: System Log Screen

Setup Screen

The Setup screen allows the step-by-step configuration of the Model 195Eg. Please see Chapter 5 for complete description on System Setup menu and examples for system configurations. See Figure 8.

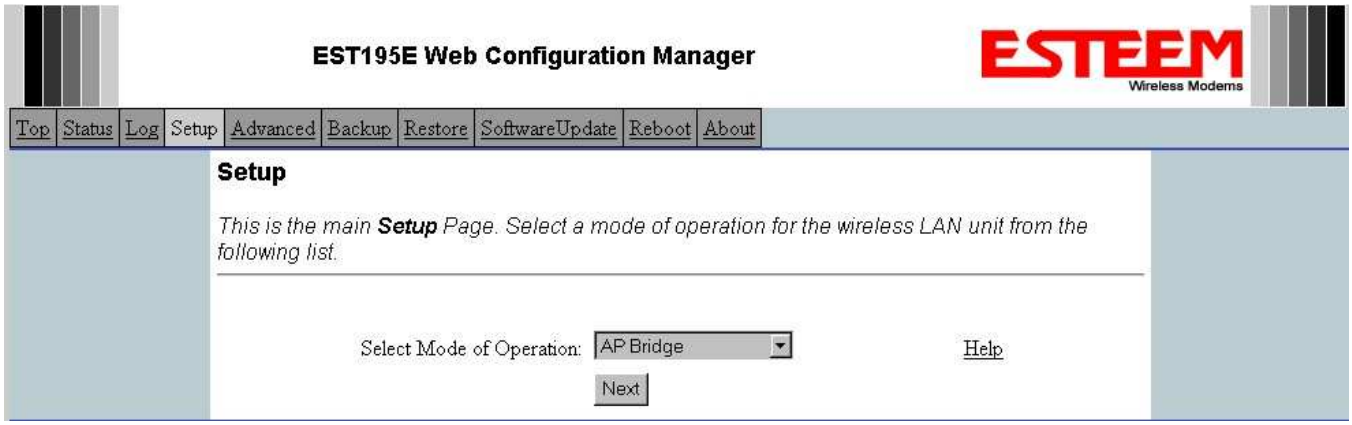

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
This is the main Setup Page. Select a mode of operation for the wireless LAN unit from the following list.
Select Mode of Operation: AP Bridge
Help
Next

Figure 8: Setup Screen

Advanced Configuration Screen

The Advanced screen allows the user to access all configuration parameters. The parameters are grouped based upon their variable. **It is recommended that only advanced users of the Model 195Eg enter this section unless instructed by ESTeem technical support**. See Figure 9.

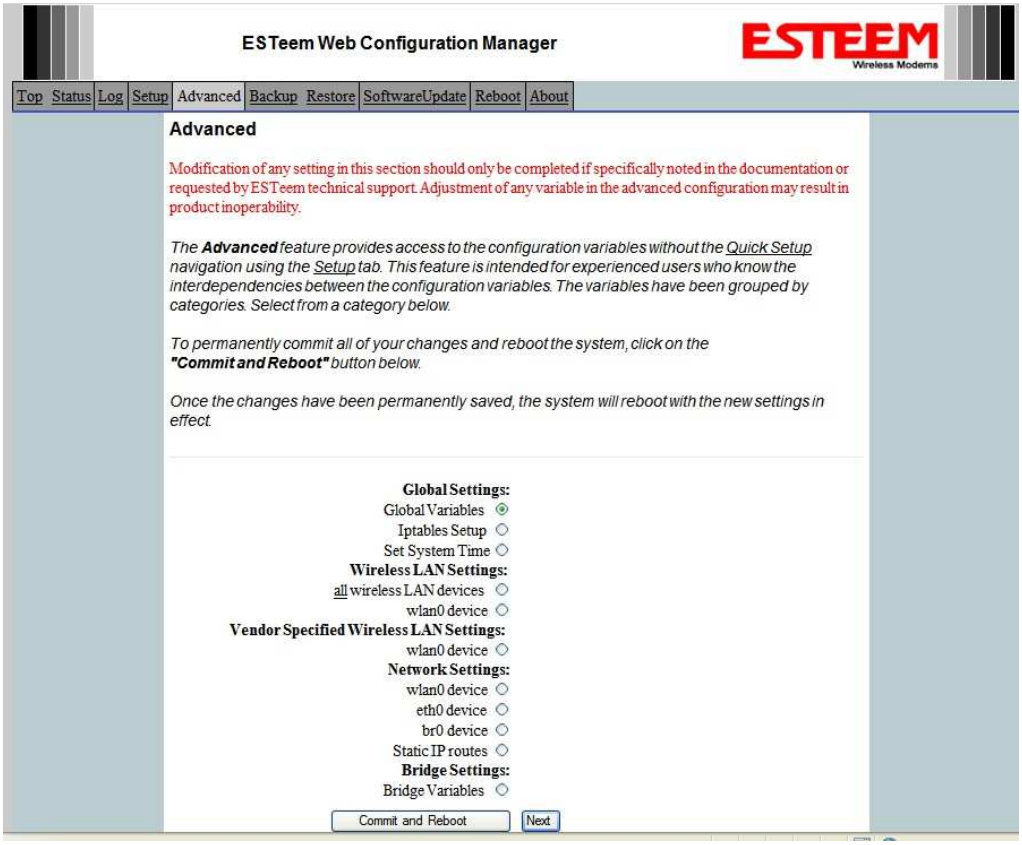

ESTeem Web Configuration Manager
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 9: Advanced Features Screen

Backup Screen

The Backup Screen saves the current configuration in the Model 195Eg to a file on the computer or network. See Figure 10. Pressing the Backup Button will create a configuration file that can be saved to the computer. This saved file can then be later opened, if necessary, by the Restore menu to quickly replace a Model 195Eg with a spare modem.

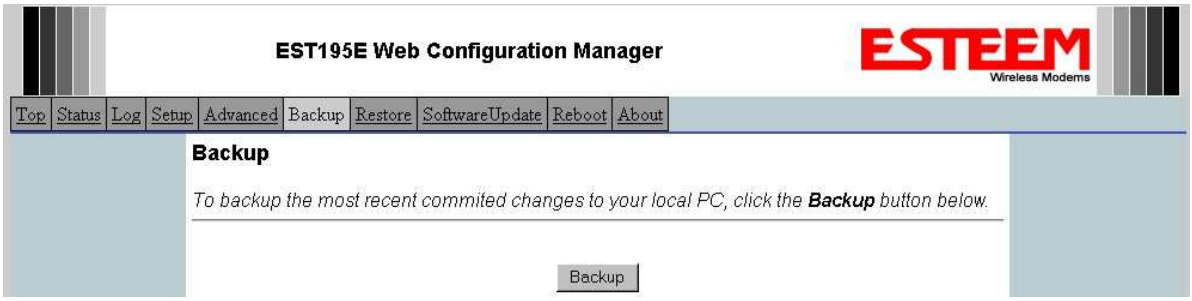

EST195E Web Configuration Manager
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Backup
To backup the most recent commited changes to your local PC, click the Backup button below.
Backup

Figure 10: Backup Screen

Restore Screen

The Restore screen is used to restore the 195Eg to factory defaults, return to the last saved configuration or to access the configuration files that were backed up to the computer. See Figure 11.

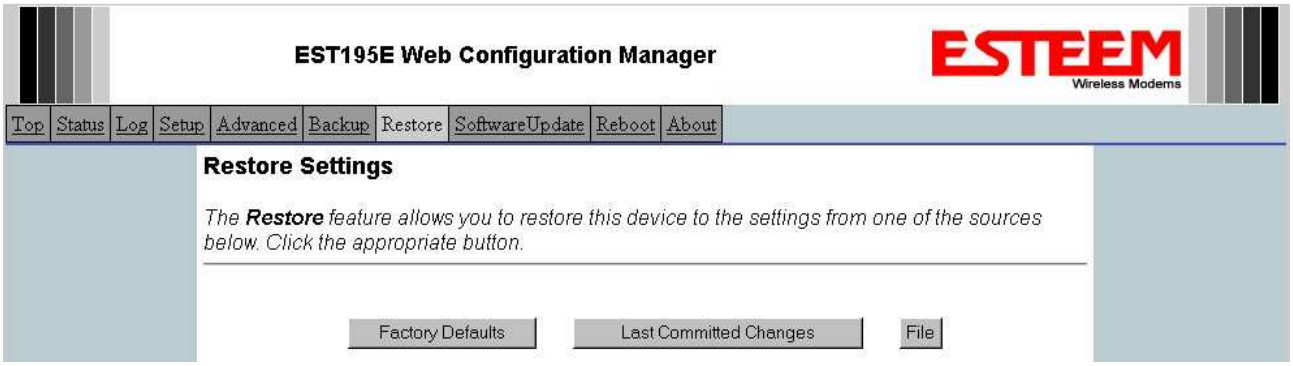


Figure 11: Restore Setting Screen

Factory Default – Returns the Model 195Eg to all factory default values.

Last Committed Changes – This button will remove any changes to the modem that have been done since the last committed changes. The last committed changes will be read from the Flash file and reset in the Model 195Eg.

File – Pressing this button will bring up a selection of where the restore file was saved during the Backup (Figure 12). Select "Upload via web browser" to browse for files saved on a local computer or select "Download from an http or ftp URL" for files saved on a network or over the Internet.

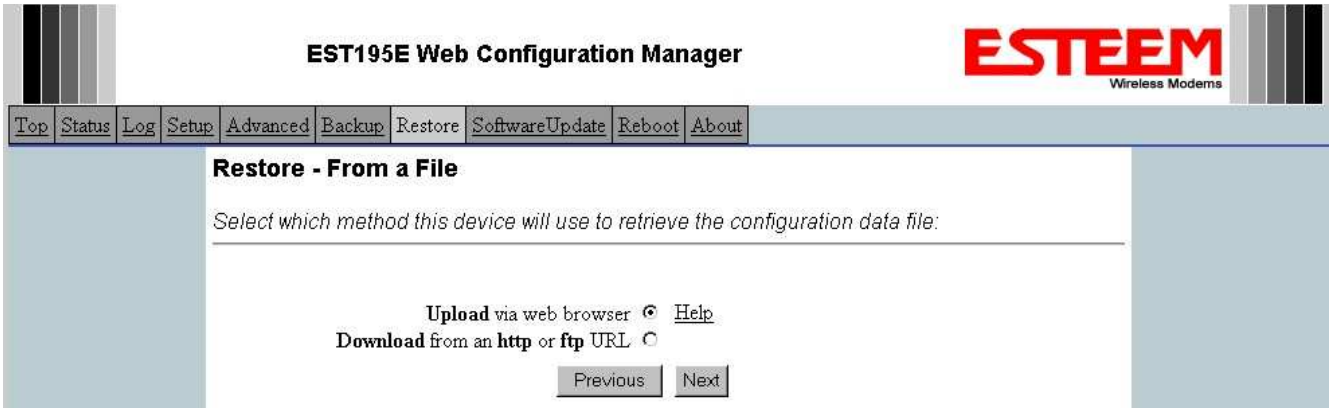


Figure 12: Restore From Local File Screen

Software Update Screen

The Software Update feature allows the user to update the latest Model 195Eg operating system software from a file supplied by the factory or the Internet to the Model 195Eg's flash memory. To upload from a file on your computer, select *Upload via web browser* and a file selection window will be displayed. To upload directly from the Internet, select *Download from an http or ftp URL* and enter the site address. See Figure 13.

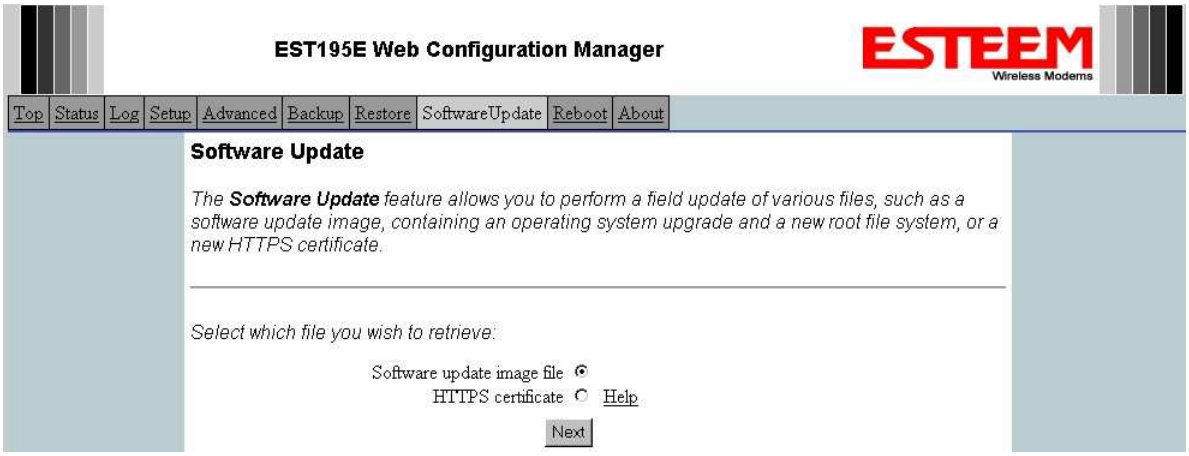


Figure 13: Software Update Screen

System Reboot Screen

The Reboot screen allows the user to reset the Model 195Eg. See Figure 14.

Figure 14: System Reboot Screen

PROGRAMMING EXAMPLES

In this chapter we will demonstrate how to program the ESTeem Model 195Eg for each of the operating modes. For a detailed explanation of the modes, please refer to Chapter 1 of this manual. In the following examples we assume that the modems have been initially configured for IP Address, Net Mask, etc. and are ready for programming from the Model 195Eg's Web Configuration Manager's Setup Menu. The first example network in Figure 1 consist of two wired Ethernet networks (Large Plant LAN and Remote Building) that will be bridged together through a repeater site and have a direct backup pathway. This same wireless mesh canopy will provide wireless access to the single PLC on the forklift (Example 4) and any other 802.11g or 802.11b devices.

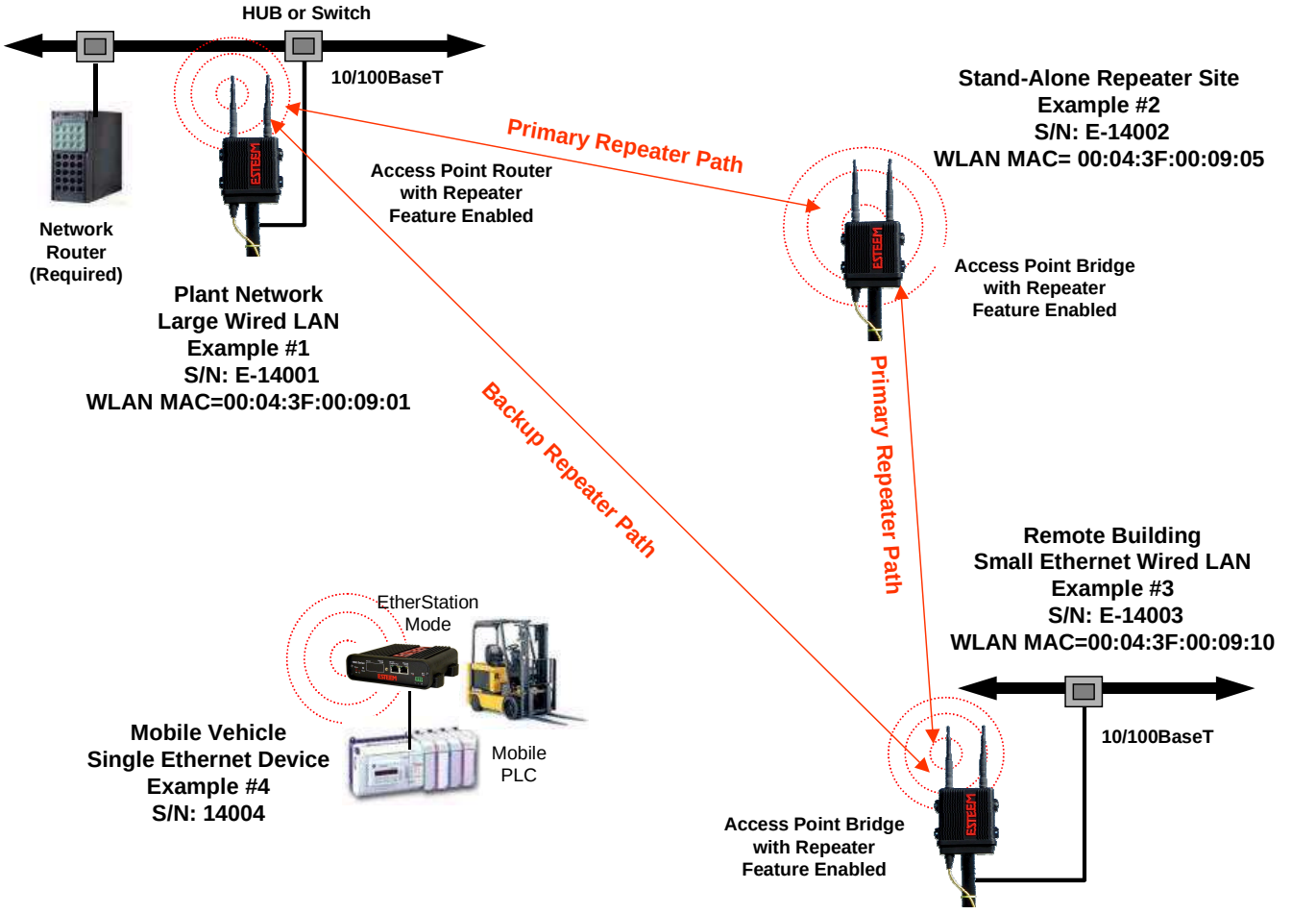


Figure 1: Programming Example #1 Diagram

The second example network in Figure 2 show how to configure the Model 195Eg if multiple Ethernet devices are connected to a single ESTeem Model 195Eg. A separate network address for the connected hardware is required and can be configured for fixed or dynamic IP (DHCP) addressing. The use of multiple network addresses will require that a network router be programmed for each of the remote devices. As we learned in Chapter 1 of this manual, the difference in the Station Router and the Station Masquerade Mode will depend upon the required availability of accessing the connected Ethernet devices to the 195Eg. The Station Router will allow devices on the Ethernet LAN to access these device and the Station Masquerade will not, very similar to a firewall.

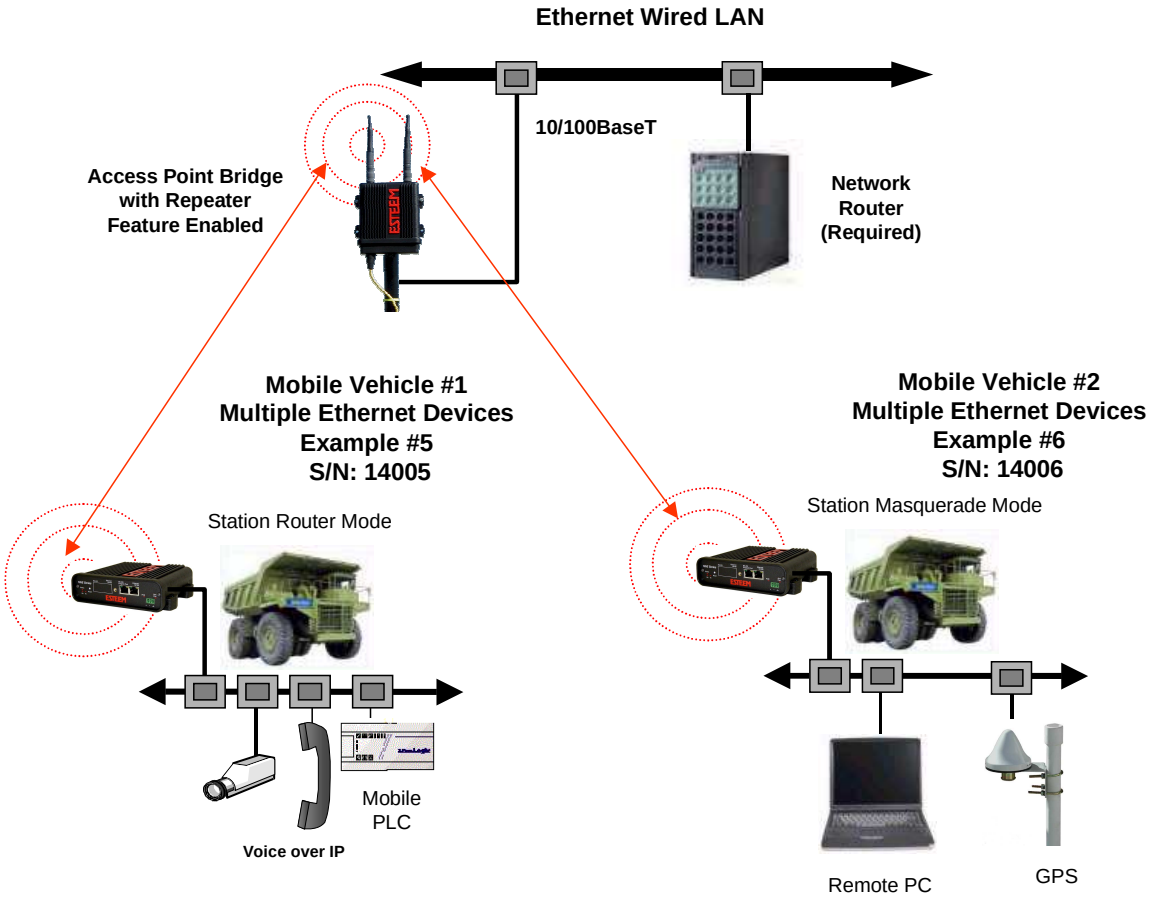


Figure 2: Programming Example #2 Diagram

Documentation

The first step when configuring your wireless system will be to document each Model 195Eg used in the network. The following is an example of the System Configuration Table (Chapter 2 – Starting Out) completed for the two example applications:

Modem_ID(Name) /Operating Mode	Serial Number	IP Address	Ethernet MAC	WLAN MAC
Plant Network AP_Router	E-14001	Ethernet 172.17.2.1 Wireless 172.16.2.1	00:04:3f:00:09:02	00:04:3f:00:09:01
Repeater AP_Bridge	E-14002	Bridge 172.16.2.5	00:04:3f:00:09:06	00:04:3f:00:09:05
Remote Building AP_Bridge	E-14003	Bridge 172.16.2.10	00:04:3f:00:09:11	00:04:3f:00:09:10
Forklift EtherStation	E-14004	N/A	00:04:3f:00:09:21	00:04:3f:00:09:20
Truck #1 Station Router	E-14005	Wireless 172.16.2.20 Ethernet 172.18.1.1	00:04:3f:00:09:26	00:04:3f:00:09:25
Truck #2 Station Masquerade	E-14006	Wireless 172.16.2.30 Ethernet 172.19.1.1	00:04:3f:00:09:31	00:04:3f:00:09:30

Table 1: Example System Configuration Table

Example 1 – Plant Network (Access Point Router with Repeater Enabled)

The ESTeem Model 195Eg configured as an Access Point Router will provide a separation between the larger Plant network and the Ethernet devices connected on the wireless network. This mode of operation is most often used when connecting the wireless system to a larger network to eliminate the Network broadcast traffic from entering the wireless system. If Ethernet devices on the Plant network want to access Ethenet devices on the wireless network, a network router is required to resolve the IP conflict created by having the wired and wireless networks on separate subnets.

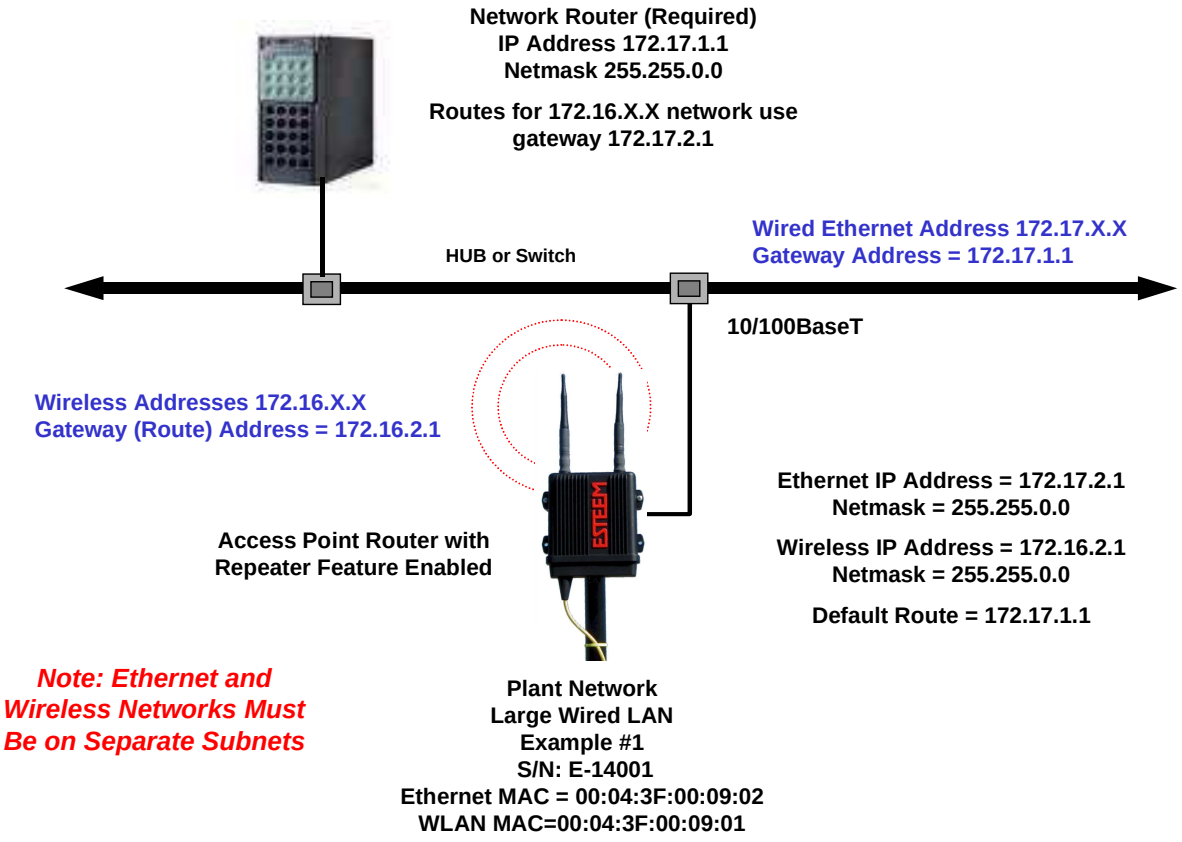


Figure 3: Access Point Router IP Addressing Example

1. Access the ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Setup from the menu items. From the Select Mode of Operation pull down box , select AP Router (Figure 4) and push the Next button below the pull down box.

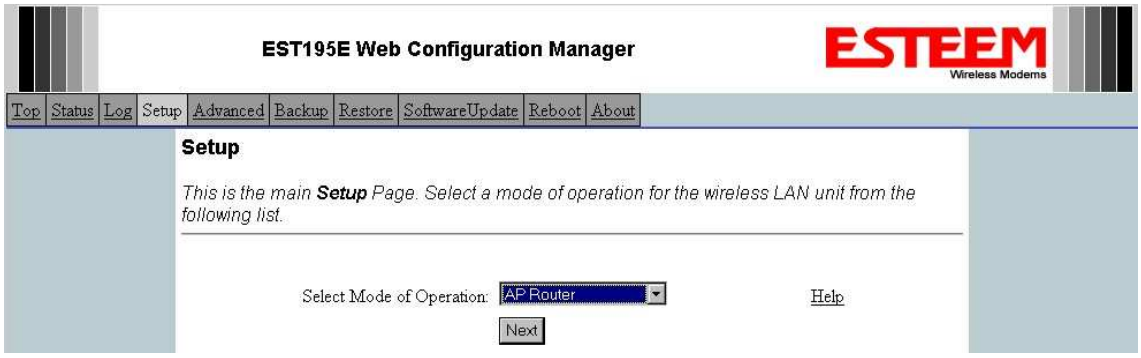


Figure 4: Access Point Router Setup Screen

Note: Throughout the Configuration Manager are Help Screens that can accessed for further information on each item.

2. Select if you want to use client or server Dynamic Host Configuration Protocol (DHCP) for the **Ethernet** device. If you want to enter a static IP address for the Model 195Eg, select Off and press the *Next* button. For our example, we have fixed IP addresses and will select Off. For more information on the operation and configuration of DHCP, please refer to Appendix C – Interface Ports. Reference Figure 5.

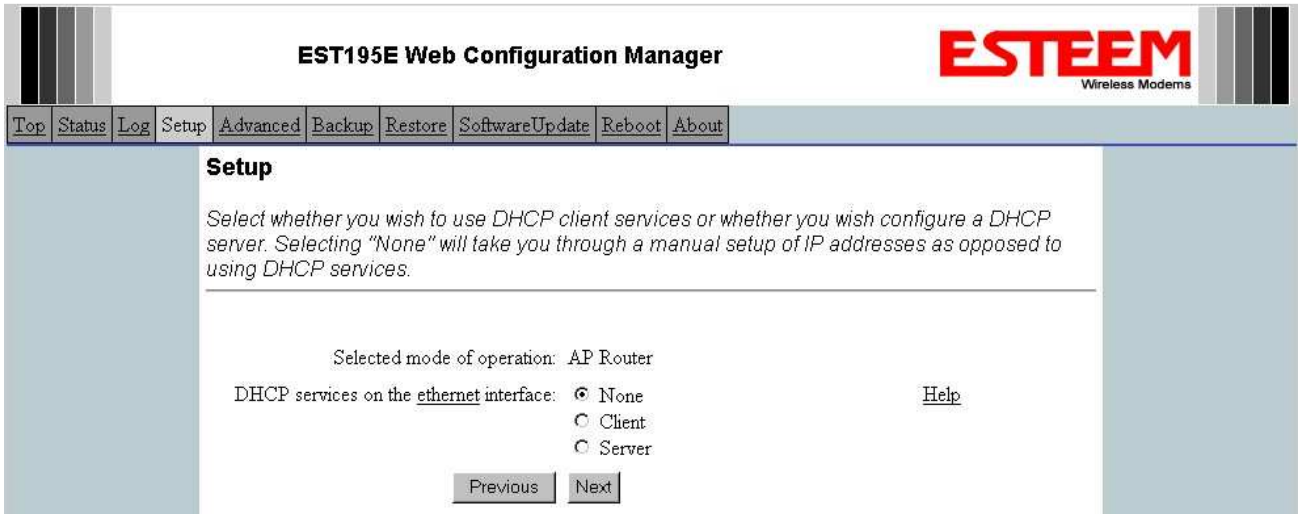


Figure 5: DHCP Ethernet Port

3. Refer to the site documentation (Table 1) and enter the IP Address and IP Netmask for the Model 195Eg on the **Ethernet** port. Reference Figure 6.

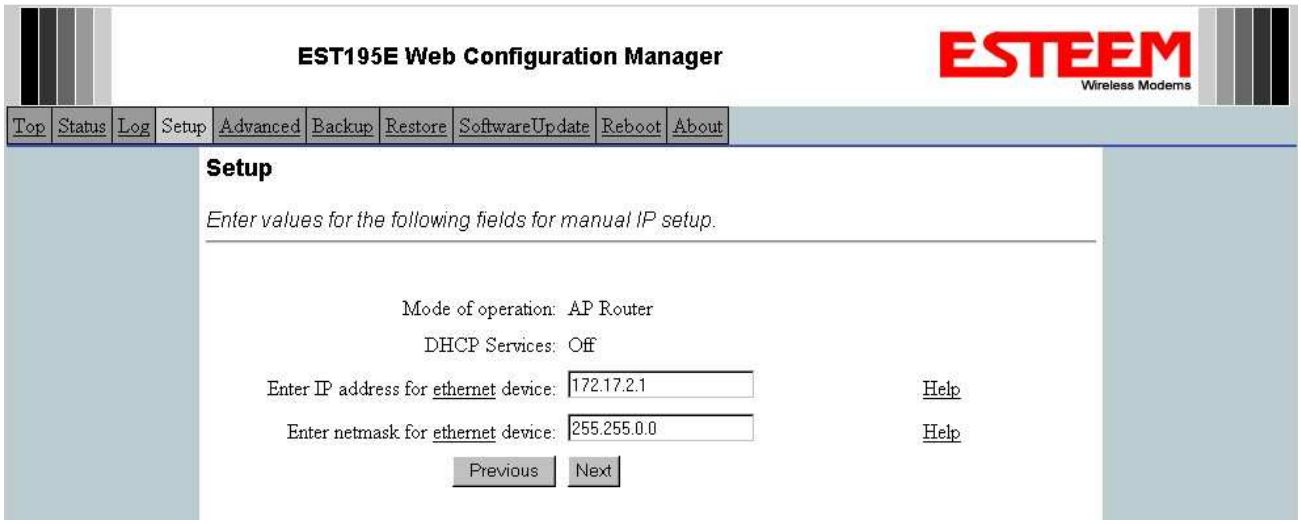


Figure 6: Ethernet IP Addressing

4. Select if you want to use client or server Dynamic Host Configuration Protocol (DHCP) for the **Wireless** device. If you want to enter a static IP address for the Model 195Eg, select Off and press the *Next* button. For our example, we have fixed IP addresses and will select Off. For more information on the operation and configuration of DHCP, please refer to Appendix C – Interface Ports. Reference Figure 7.

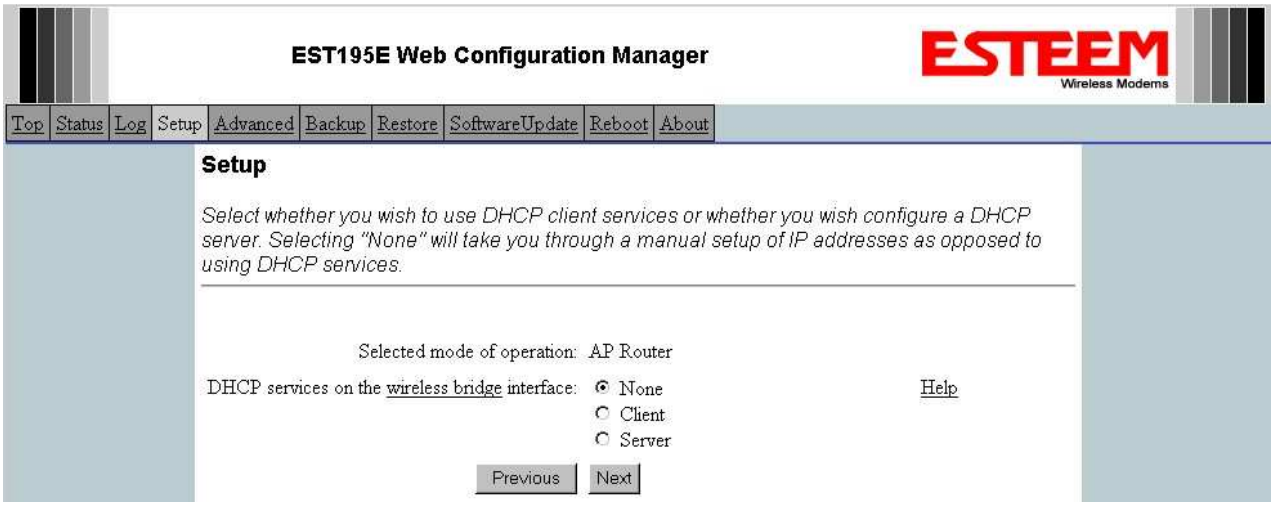

EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Select whether you wish to use DHCP client services or whether you wish configure a DHCP server. Selecting "None" will take you through a manual setup of IP addresses as opposed to using DHCP services.
Selected mode of operation: AP Router
DHCP services on the wireless bridge interface:
None
Client
Server
Help
Previous
Next

Figure 7: DHCP Wireless Port

5. Refer to the site documentation (Table 1) and enter the IP Address and IP Netmask for the Model 195Eg on the **Wireless** port. Reference Figure 8.

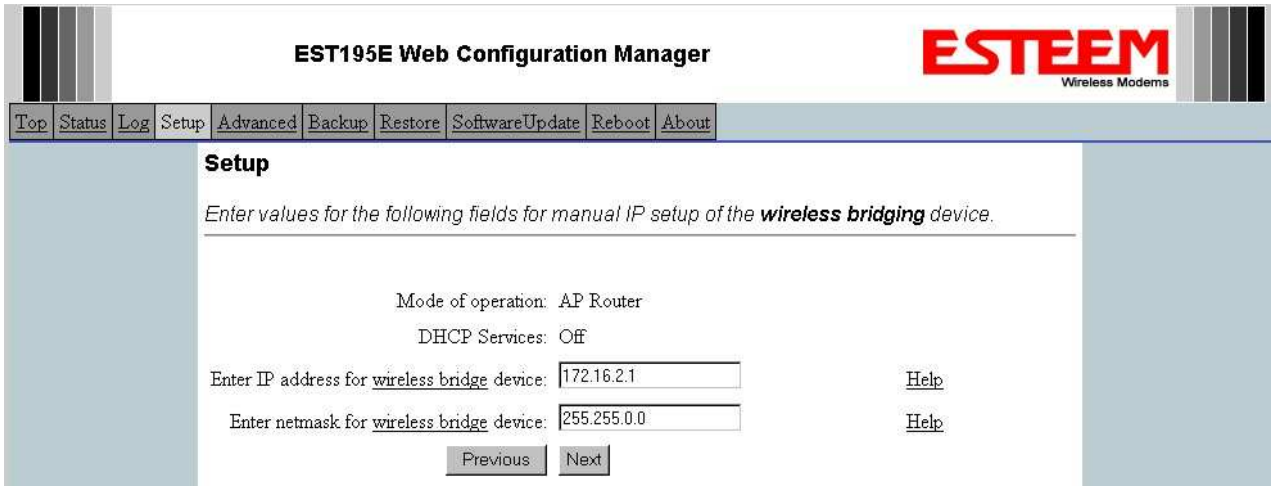

EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter values for the following fields for manual IP setup of the wireless bridging device.
Mode of operation: AP Router
DHCP Services: Off
Enter IP address for wireless bridge device: 172.16.2.1
Help
Enter netmask for wireless bridge device: 255.255.0.0
Help
Previous
Next

Figure 8: Wireless IP Address

6. Enter the default route (Gateway) address for the network. This AP Router 195Eg will use the Network Router for address resolution (Figure 3). Enter the IP address for the Network Router and any DNS server information. If you are not connecting the Model 195Eg to the Internet, leave blank and press the *Next* button. Figure 9.

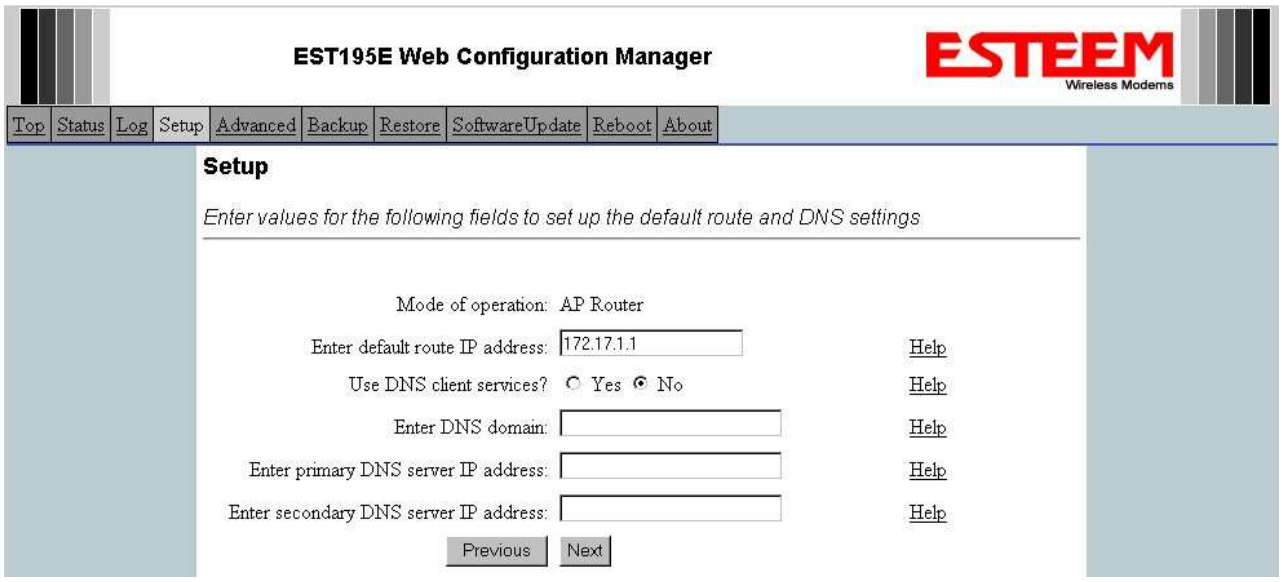


Figure 9: Wireless Security Level Settings

7. Select *Yes* if you will be using security for client access to your wireless network (recommened).

NOTE: The setting of this security level is ONLY for client access to the Model 195Eg. The security of the Bridge communication between the Model 195Eg's is separate and will be configured during the repeater configuration.

Enter the SSID for your 802.11g network. The SSID is the unique identification for your wireless network and all 802.11g devices that share a wireless network MUST have the same SSID code. This identification code is case sensitive and must NOT contain spaces. Reference Figure 10.

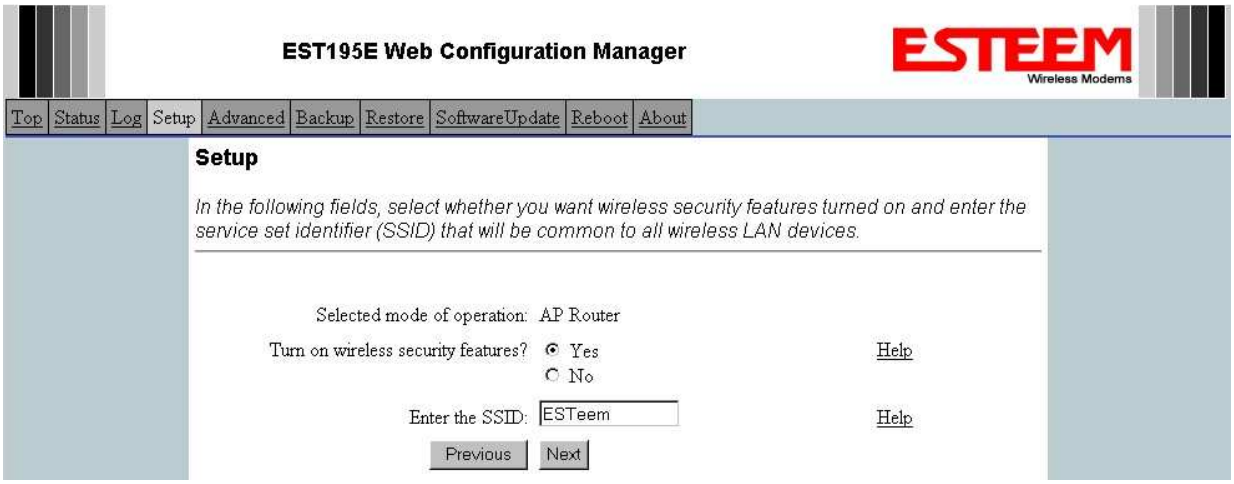


Figure 10: WEP Key Entry

8. Select the encryption level for the wireless client access to the network. For further information on the different levels of security, please refer to Appendix E – Security of this User's Manual. If you would like to hide the SSID from broadcasting from the Access Point and would like to discard the broadcast probes select **Yes**. If Yes is selected the Model 195Eg will no longer send out periodic SSID radio beacons that can be identified with 802.11b network scanning software. The users of the network will have to know the SSID to enter the network and security is increased, but if you want the SSID to be broadcast to the network for easy identification then select **No**. In our example, we will be using mobile clients with 128 bit WEP. Reference Figure 11.

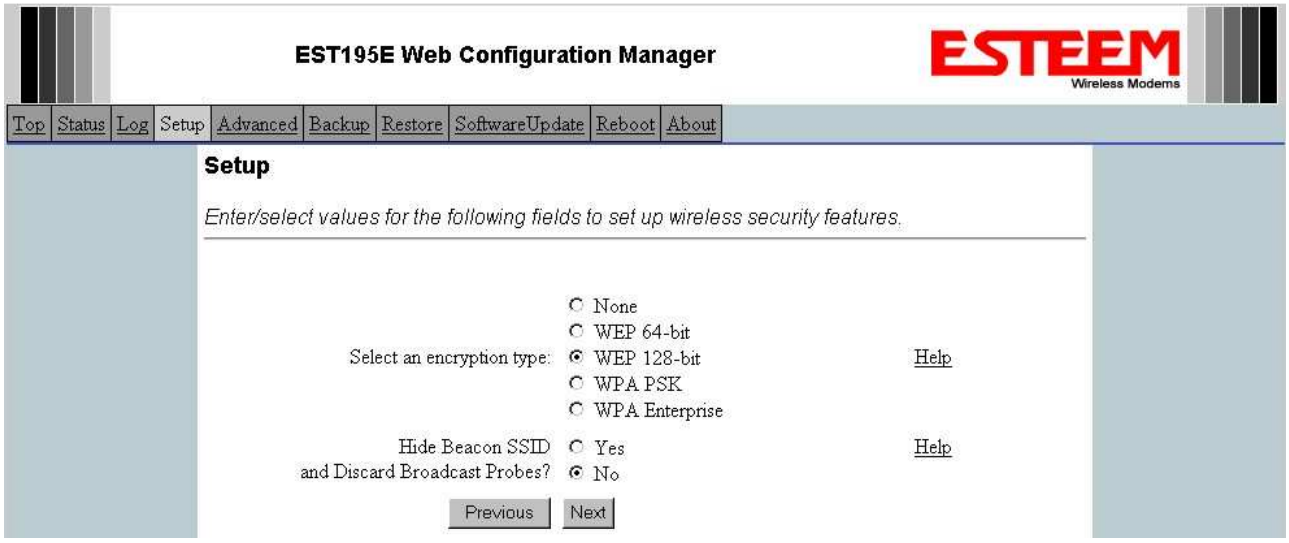


Figure 11: Security Selection

9. Enter the WEP key values for your application that will be used by all devices on the wireless network. Reference Figure 12.

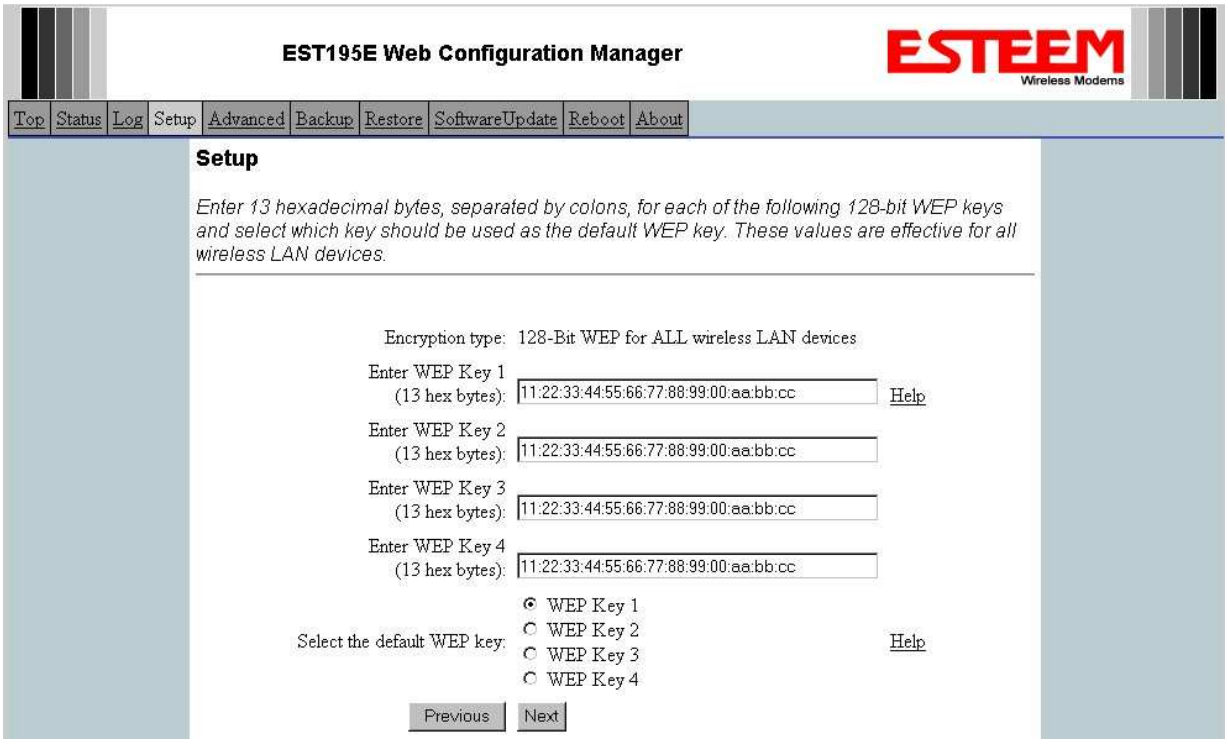

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter 13 hexadecimal bytes, separated by colons, for each of the following 128-bit WEP keys and select which key should be used as the default WEP key. These values are effective for all wireless LAN devices.
Encryption type: 128-Bit WEP for ALL wireless LAN devices
Enter WEP Key 1 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Help
Enter WEP Key 2 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 3 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 4 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Select the default WEP key:
WEP Key 1
WEP Key 2
WEP Key 3
WEP Key 4
Help
Previous
Next

Figure 12: WEP Key Input Screen

10. Enter the values for the Access Control List (ACL). This is a configurable MAC filter that can be set to allow or deny specific wireless MAC address to the network. This feature is further explained in Appendix E – Security. In our example we will not use the ACL. Reference Figure 13.

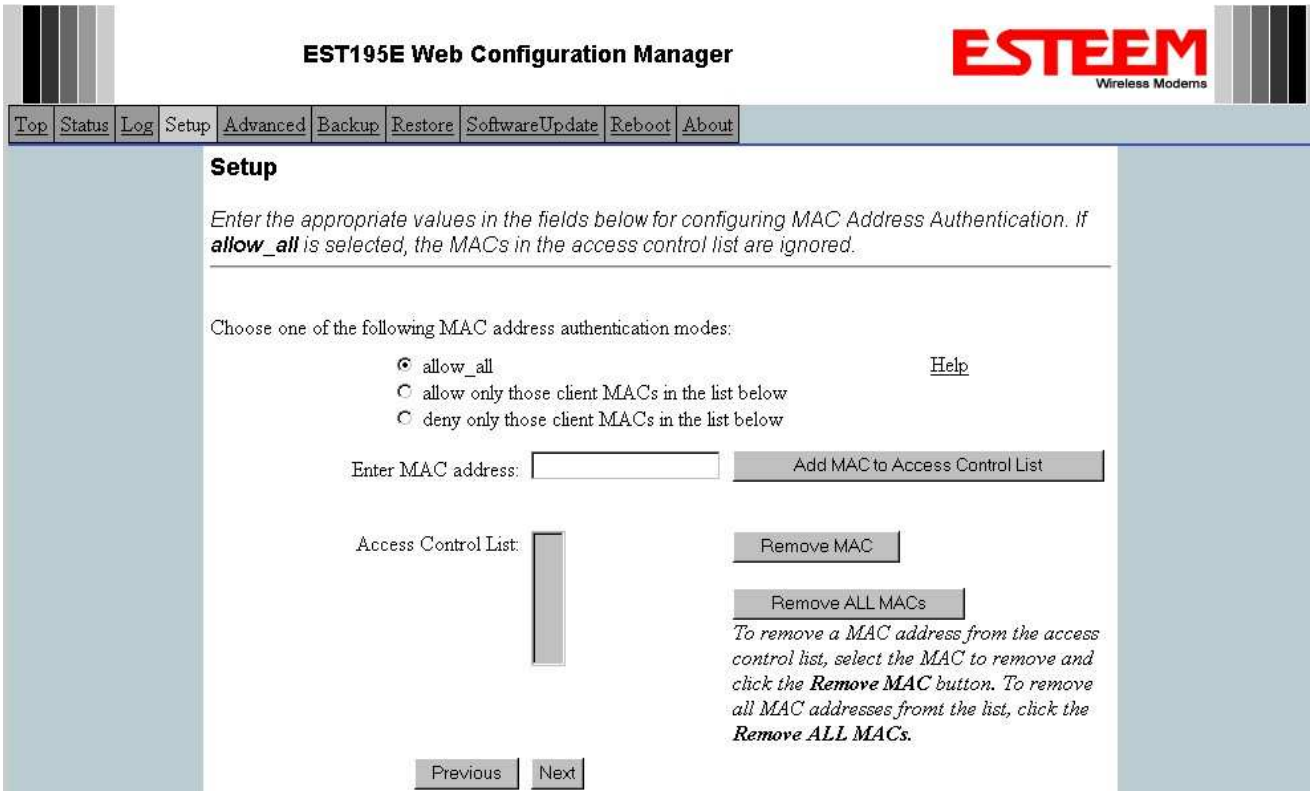

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
Enter the appropriate values in the fields below for configuring MAC Address Authentication. If allow_all is selected, the MACs in the access control list are ignored.
Choose one of the following MAC address authentication modes:
allow_all
allow only those client MACs in the list below
deny only those client MACs in the list below
Help
Enter MAC address:
Add MAC to Access Control List
Access Control List:
Remove MAC
Remove ALL MACs
To remove a MAC address from the access control list, select the MAC to remove and click the Remove MAC button. To remove all MAC addresses fromt the list, click the Remove ALL MACs.
Previous
Next

Figure 13: Access Control List Settings

11. Select the frequency channel of operation. All Access Points in the same Repeater Peer network need to be on the same radio frequency channel. See Appendix D – Radio Configuration for help in selecting the frequency channel. Reference Figure 14.

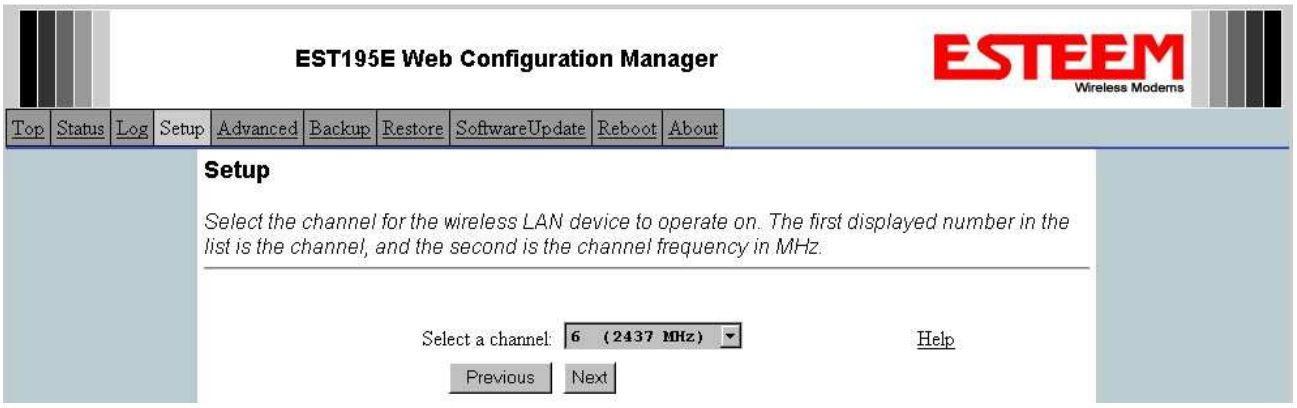


Figure 14: Radio Channel Selection

12. The Repeater Peer Table (Figure 15) identifies which Model 195Eg's will bridge wireless Ethernet communication. Only other Access Point Repeaters need to be listed not the Model 195Eg's in client modes. Multiple links to the same destination will provide a backup pathway (Mesh Network) if the primary pathway is lost. Looking at the system layout in Figure 1, both the repeater site and the direct link will be listed. Using the System Configuration Table (Table 1) as a guide, enter the Wireless (WLAN) MAC address for the 195Eg's that will communicate with the Access Point Router (Example 1) starting with the primary repeater path through the stand-alone repeater.

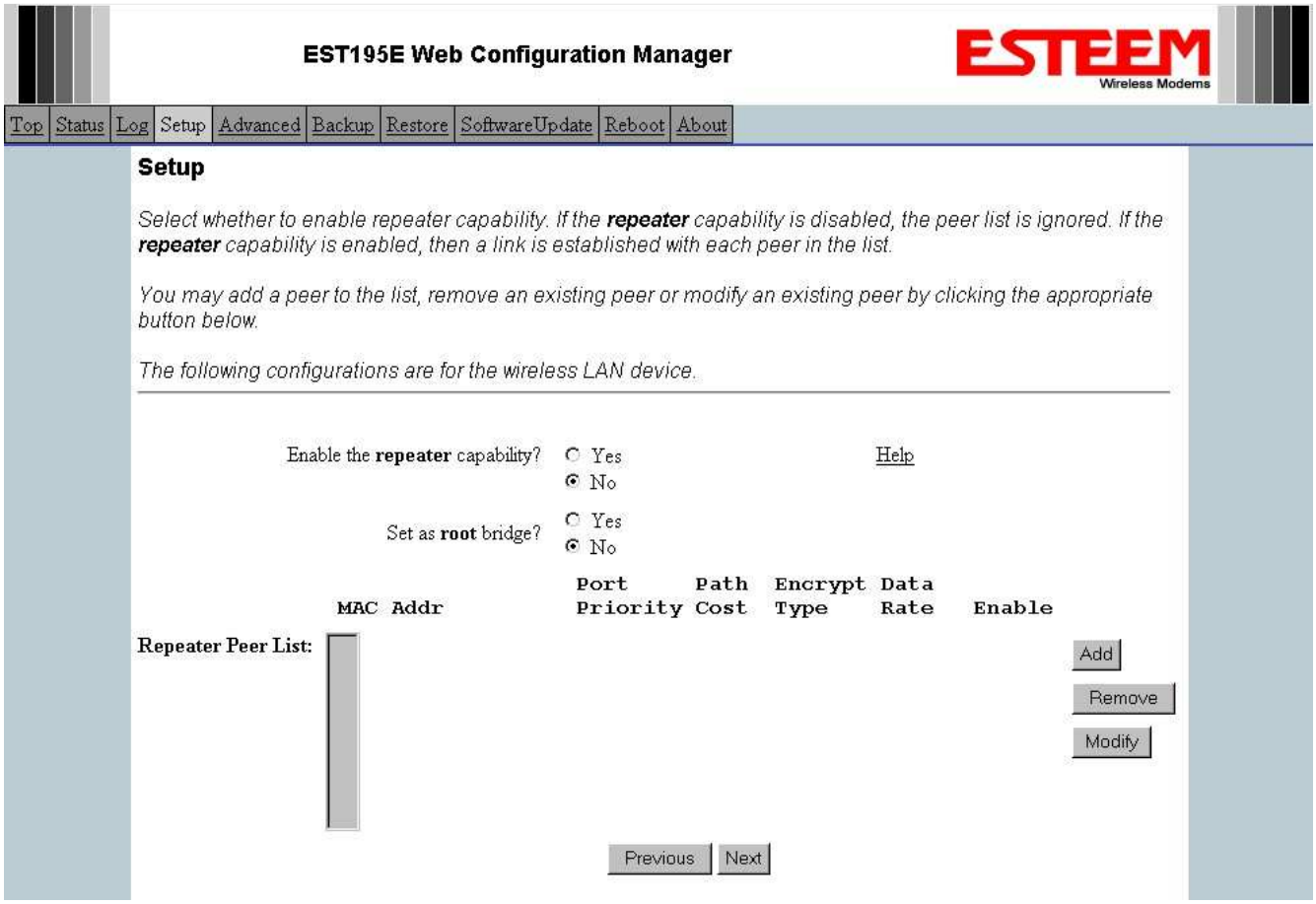


Figure 15: Blank Repeater Table

The communication link through repeater site is the best radio path from the Plant Network to the Remote Building and we want this link to be the primary repeater route. The 195Eg follows the same networking "rules" as any other Ethernet device and if we made no changes to the default path cost of 100 the lowest path cost would be directly to the Remote Building (Direct = 100, Repeater = 200 (100+100)). To configure the 195Eg to select the repeater as the primary radio path, the direct link's path cost must be greater than the cost through the repeater link (any number greater than 200). We will set the path cost at 201 for the direct link, making the repeater link a lower path cost and thus the primary pathway. Press the *Add* button to enter the first repeater link to the Repeater Peer List and Figure 16 will be displayed.

Note: For a more complete description on configuring repeater routes, see Chapter 6 – Repeating Features.

First Repeater Link -

Enter the Wireless (WLAN) MAC address of the stand-alone repeater site and the path cost for this link will stay at the default value at 100. Select the level of Encryption for this communication link. The encryption levels for the repeater peer link must be the same on both sides, but is completely independent from the Encryption level for the client access to the network. For consistency in our example, we will also use 128-Bit WEP Encryption for the Repeater Peer link. Setting the link data rate to Dynamic will allow all data rates from 1 Mbps to 54 Mbps to be used. Verify the Repeater Link is set to Enable and press the *Create Repeater Peer Button.*

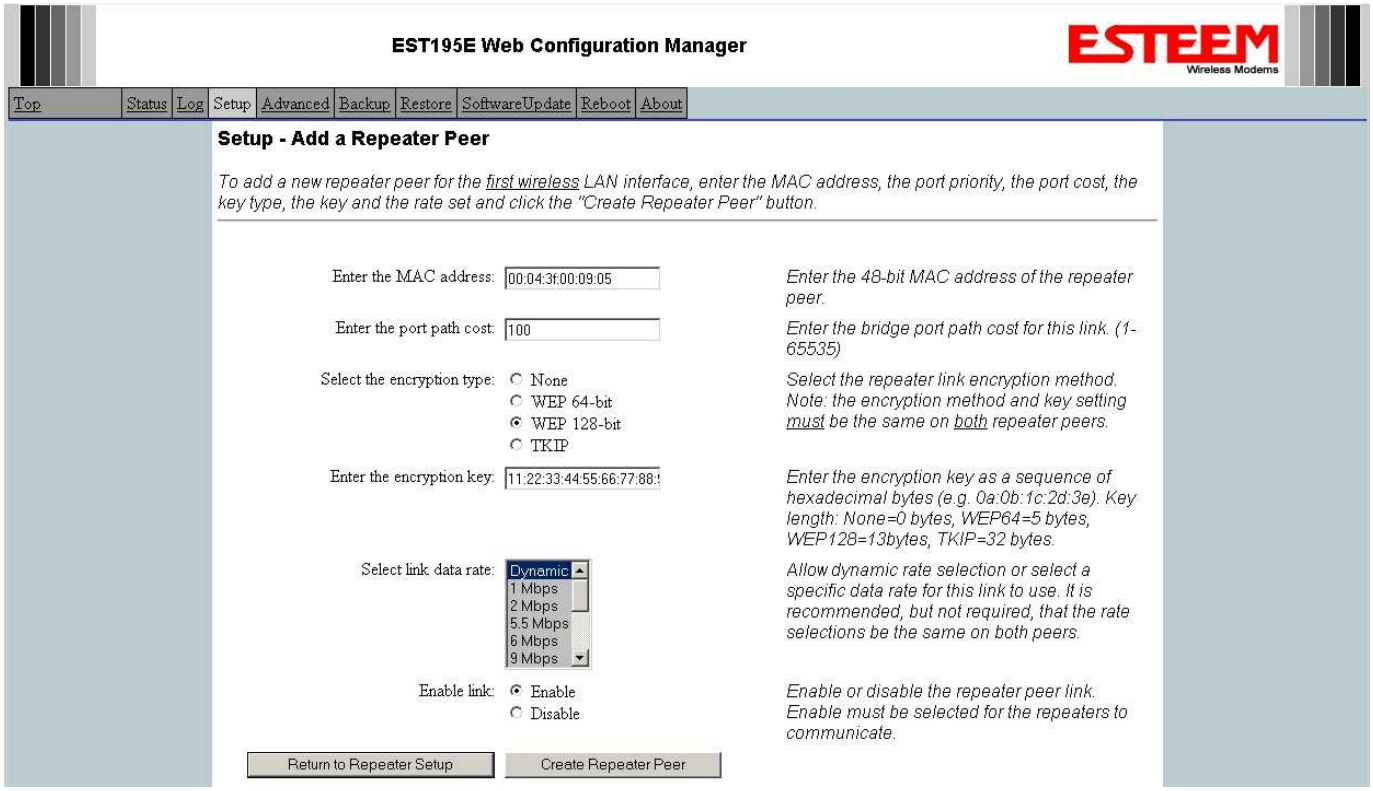

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup - Add a Repeater Peer
To add a new repeater peer for the first wireless LAN interface, enter the MAC address, the port priority, the port cost, the key type, the key and the rate set and click the "Create Repeater Peer" button.
Enter the MAC address:
00:04:3f:00:09:05
Enter the 48-bit MAC address of the repeater peer.
Enter the port path cost:
100
Enter the bridge port path cost for this link. (1-65535)
Select the encryption type:
None
WEP 64-bit
WEP 128-bit
TKIP
Select the repeater link encryption method. Note: the encryption method and key setting must be the same on both repeater peers.
Enter the encryption key:
11:22:33:44:55:66:77:88:
Enter the encryption key as a sequence of hexadecimal bytes (e.g. 0a:0b:1c:2d:3e). Key length: None=0 bytes, WEP64=5 bytes, WEP128=13bytes, TKIP=32 bytes.
Select link data rate:
Dynamic
1 Mbps
2 Mbps
5.5 Mbps
6 Mbps
9 Mbps
Allow dynamic rate selection or select a specific data rate for this link to use. It is recommended, but not required, that the rate selections be the same on both peers.
Enable link:
Enable
Disable
Enable or disable the repeater peer link. Enable must be selected for the repeaters to communicate.
Return to Repeater Setup
Create Repeater Peer

Figure 16: First (Primary) Repeater Link

Second Repeater Link (Direct Path) -

Press the Add button a second time (Figure15) and Figure 17 will be displayed. Enter the Wireless (WLAN) MAC address of the Remote Building and set the path cost for this link to a value of 201. Select the level of Encryption for this communication link. The encryption levels for the repeater peer link must be the same on both sides, but is completely independent from the Encryption level for the client access to the network. For consistency in our example, we will also use 128-Bit WEP Encryption for the Repeater Peer link. Setting the link data rate to Dynamic will allow all data rates from 1 Mbps to 54 Mbps to be used. Verify the Repeater Link is set to Enable and press the *Create Repeater Peer Button.*

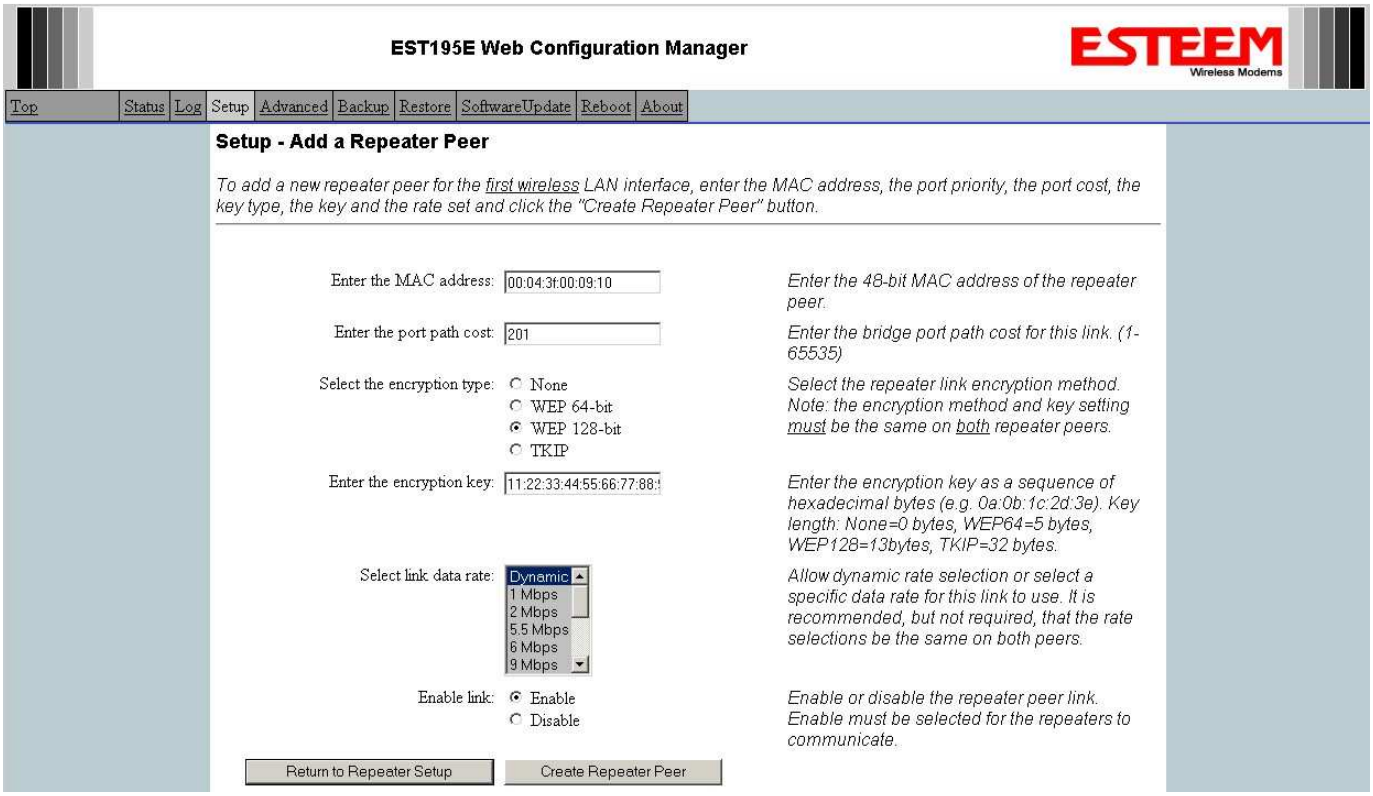

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup - Add a Repeater Peer
To add a new repeater peer for the first wireless LAN interface, enter the MAC address, the port priority, the port cost, the key type, the key and the rate set and click the "Create Repeater Peer" button.
Enter the MAC address:
00:04:3f:00:09:10
Enter the 48-bit MAC address of the repeater peer.
Enter the port path cost:
201
Enter the bridge port path cost for this link. (1-65535)
Select the encryption type:
None
WEP 64-bit
WEP 128-bit
TKIP
Select the repeater link encryption method. Note: the encryption method and key setting must be the same on both repeater peers.
Enter the encryption key:
11:22:33:44:55:66:77:88:1
Enter the encryption key as a sequence of hexadecimal bytes (e.g. 0a:0b:1c:2d:3e). Key length: None=0 bytes, WEP64=5 bytes, WEP128=13bytes, TKIP=32 bytes.
Select link data rate:
Dynamic
1 Mbps
2 Mbps
5.5 Mbps
6 Mbps
9 Mbps
Allow dynamic rate selection or select a specific data rate for this link to use. It is recommended, but not required, that the rate selections be the same on both peers.
Enable link:
Enable
Disable
Enable or disable the repeater peer link. Enable must be selected for the repeaters to communicate.
Return to Repeater Setup
Create Repeater Peer

Figure 17: Second (Backup) Repeater Link

Figure 18 displays the complete repeater peer list with both repeater peer entries. Set Enable repeater capability to *Yes* and to both repeater paths. This Access Point Router 195Eg is also the primary data path for all Ethernet traffic on the network and will also need to be configured as the Root Bridge. Press the *Next* button to continue.

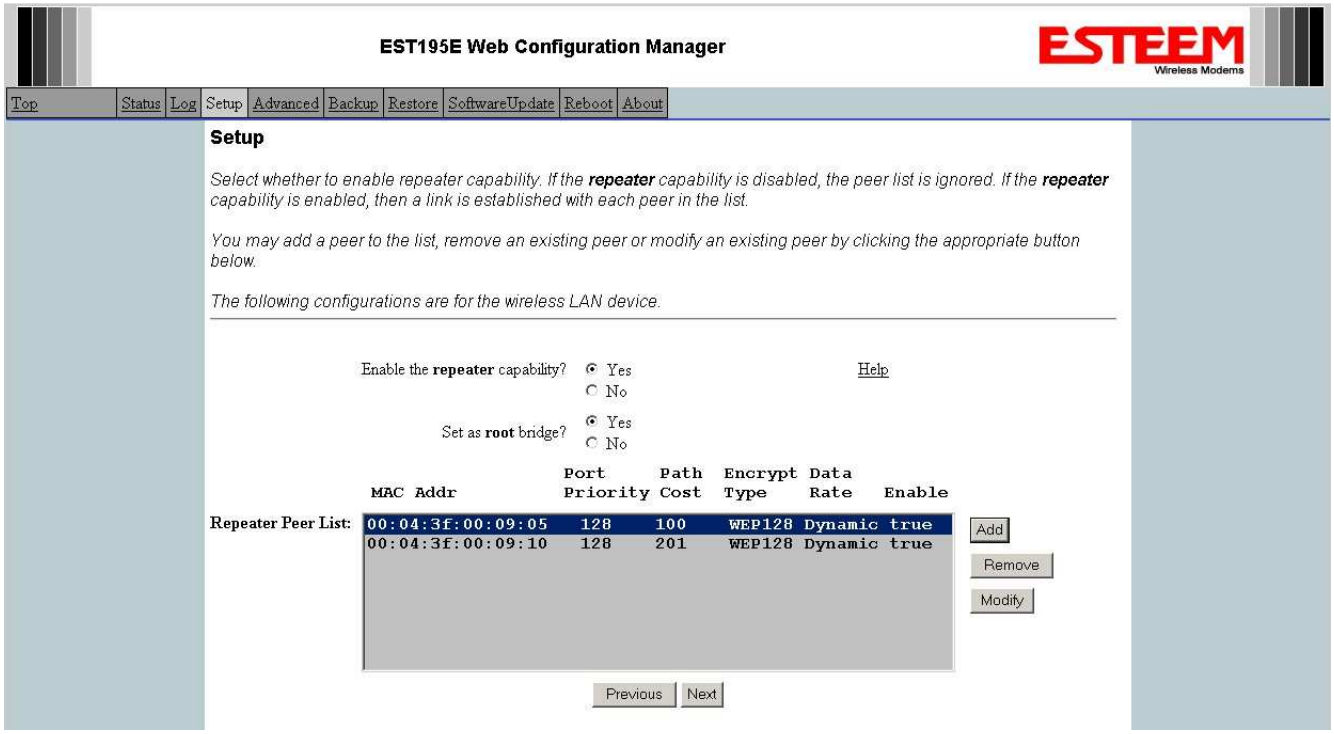


Figure 18: Completed Repeater Peer List

13. Figure 19 will be displayed. If no further changes are necessary to the modem, you can commit the changes that will then be saved and the modem rebooted.

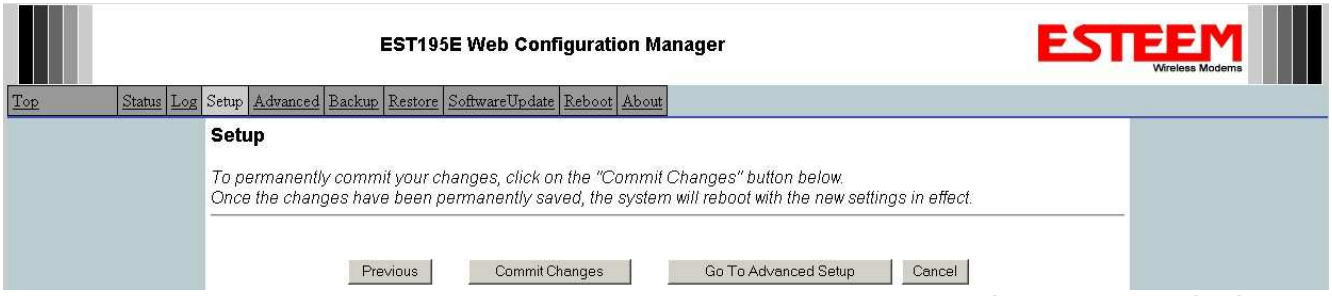


Figure 19: Commit Changes

Example 2 – Stand Alone Repeater (Access Point Bridge with Repeater Enabled)

Review the example diagram, Figure 1, and locate the 195Eg marked as Example #2. This ESTeem is being used by two other Model 195Eg's as a repeater but is not connected to an Ethernet network. This modem should be configured for Access Point Bridge mode.

1. Access the ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Setup from the menu items. From the Select Mode of Operation pull down box , select AP Bridge (Figure 20) and push the *Next* button below the pull down box.

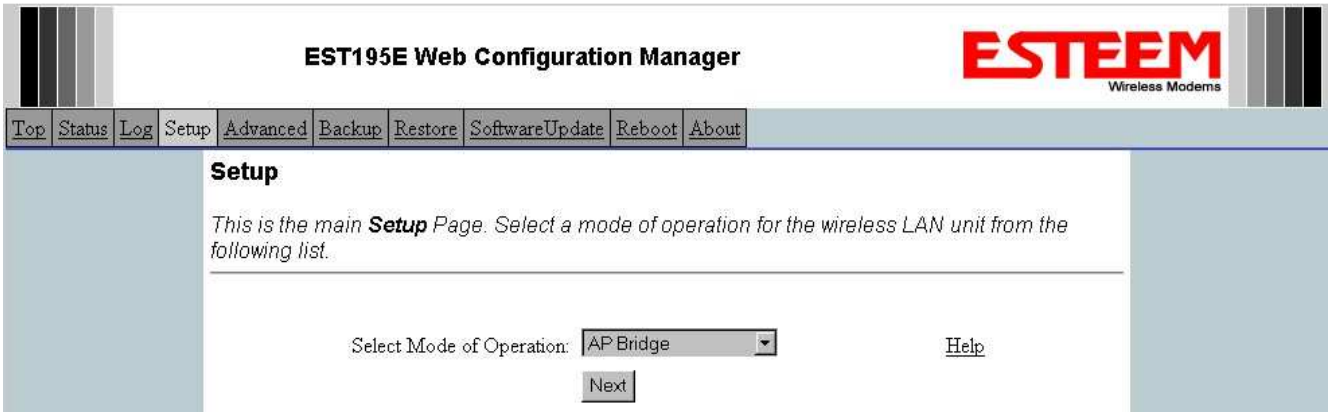


Figure 20: Access Point Bridge

2. Select if you want to use client or server Dynamic Host Configuration Protocol (DHCP) for the 195Eg. If you want to enter a static IP address for the Model 195Eg, select Off and press the Next button. For our example, we have fixed IP addresses and will select Off. Reference Figure 21.

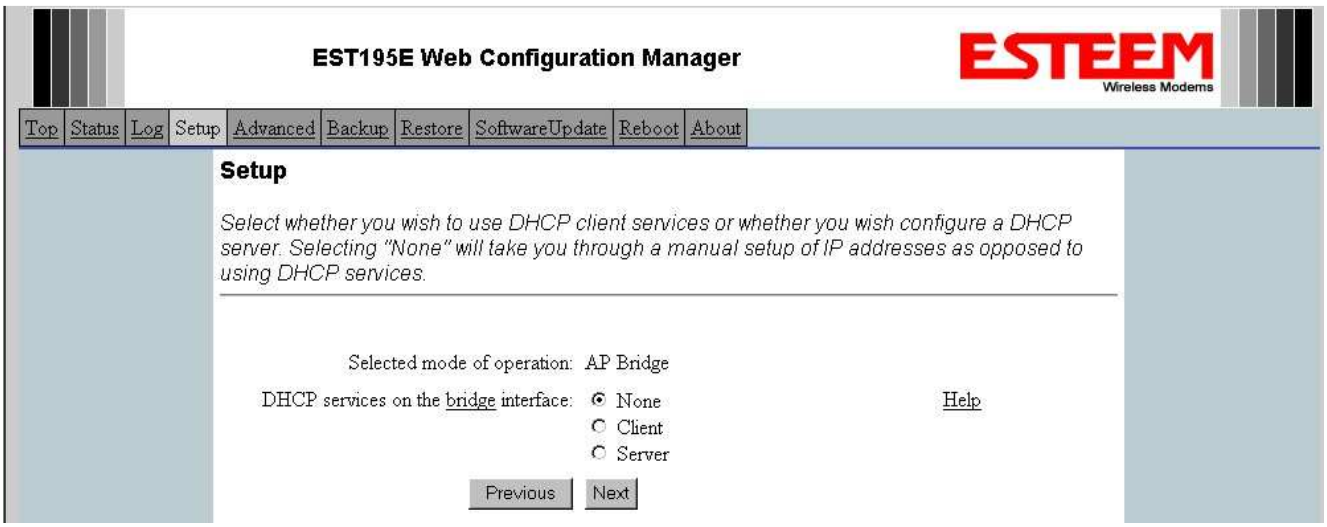


Figure 21: DHCP Configuration

3. Enter the **bridge** IP Address and IP Netmask for the Model 195Eg. You will notice that for the 195Eg in AP Bridge mode only a single IP address in entered. Both the ethernet IP and wireless IP addresses will be the same in the bridge mode. Reference Figure 22.

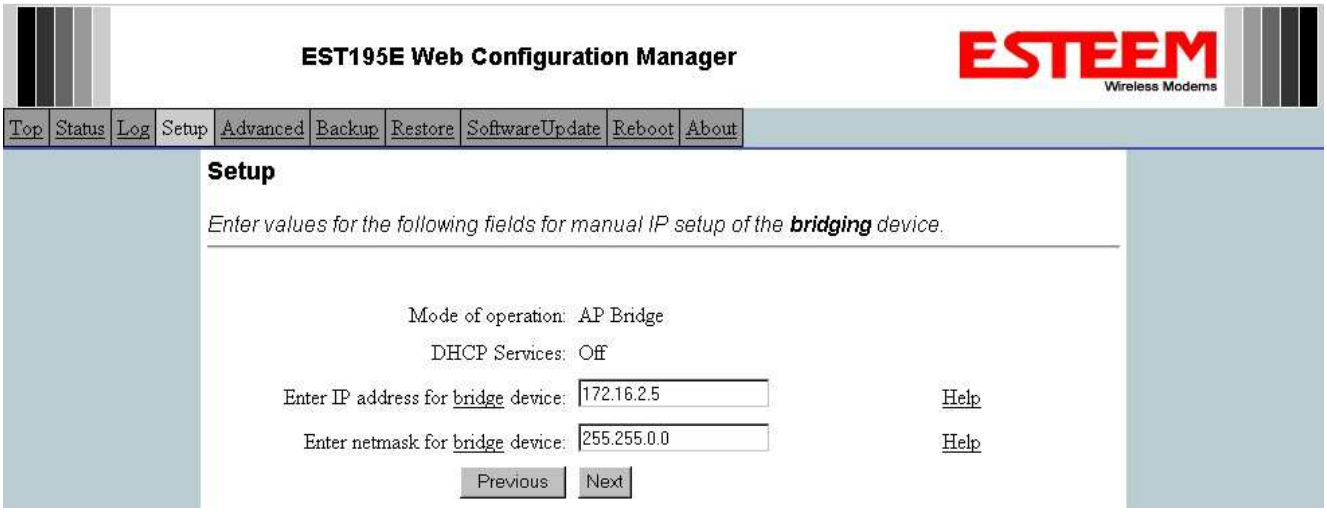


Figure 22: Bridge IP Addresses

4. Enter the default route (Gateway) address for the network. For Ethernet devices on the wireless network (IP 172.16.X.X – See Figure 3), the AP Router 195Eg will be the gateway. Enter the **wireless** IP address for the AP Router 195Eg (configured in Example 1) and any DNS server information. If you are not connecting the Model 195Eg to the Internet, leave blank and press the *Next* button. Figure 23.

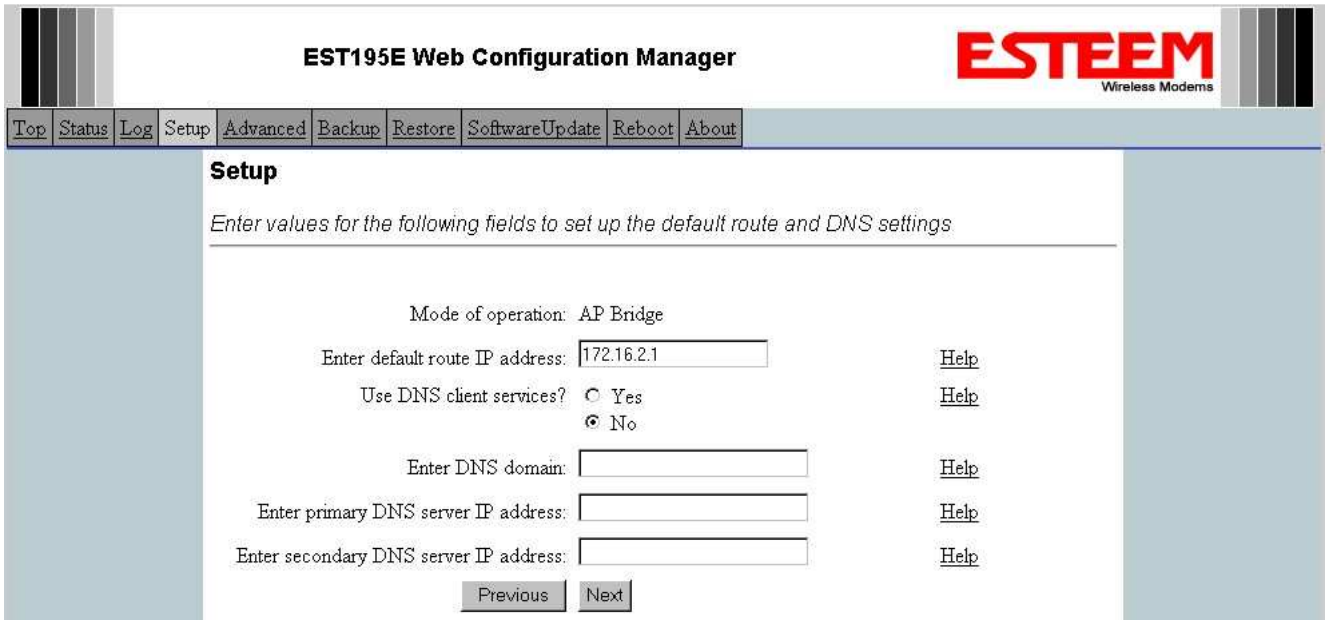


Figure 23: Default Route (Gateway) and DNS Configuration

5. Select *Yes* if you will be using security for your wireless network (recommened).

NOTE: The setting of this security level is ONLY for client access to the Model 195Eg. The security of the Bridge communication between the Model 195Eg's is separate and will be configured during the repeater configuration.

Enter the SSID for your 802.11g network. The SSID is the unique identification for your wireless network and all 802.11g devices that share a wireless network MUST have the same SSID code. This identification code is case sensitive and must NOT contain spaces. Reference Figure 24.

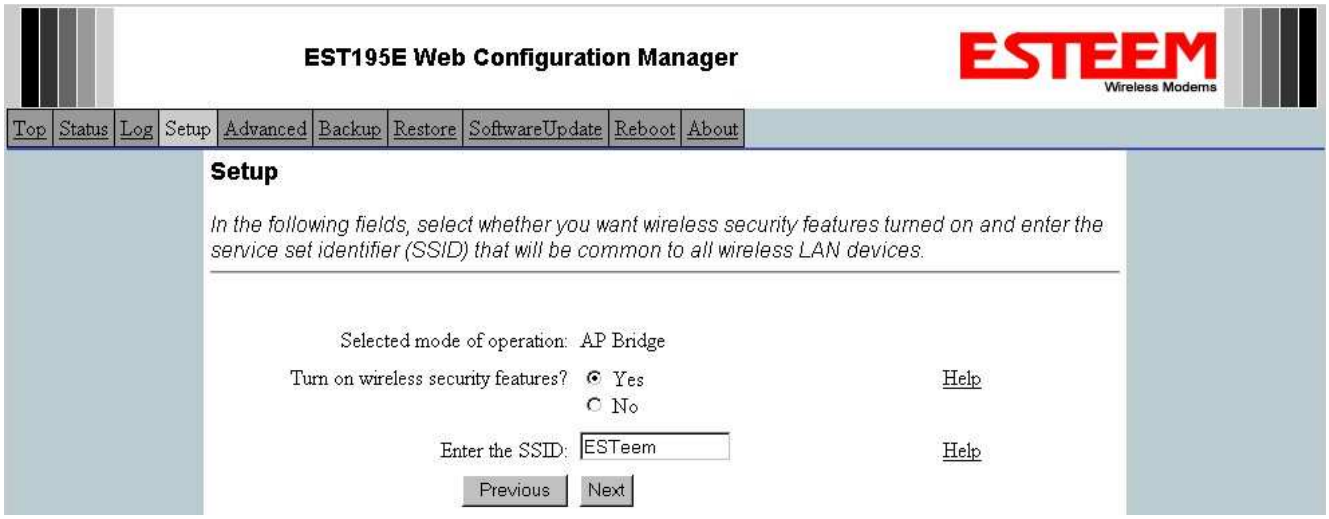


Figure 24: Security and SSID Configuration

6. Select the encryption level for client access to the wireless network. For further information on the different levels of security, please refer to Appendix E – Security of this User's Manual. If you would like to hide the SSID from broadcasting from the Access Point select **Yes**. If Yes is selected the Model 195Eg will not send out periodic SSID radio beacons that can be identified with 802.11b network scanning software. The users of the network will have to know the SSID to enter the network and security is increased, but if you want the SSID to be broadcast to the network for easy identification then select **No**. The 195Eg can also be configured to discard the probe requests from 802.11g clients. If desired, set Discard Broadcast Probes to Yes. In our example, we will be using mobile clients with 128 bit WEP. Reference Figure 25.

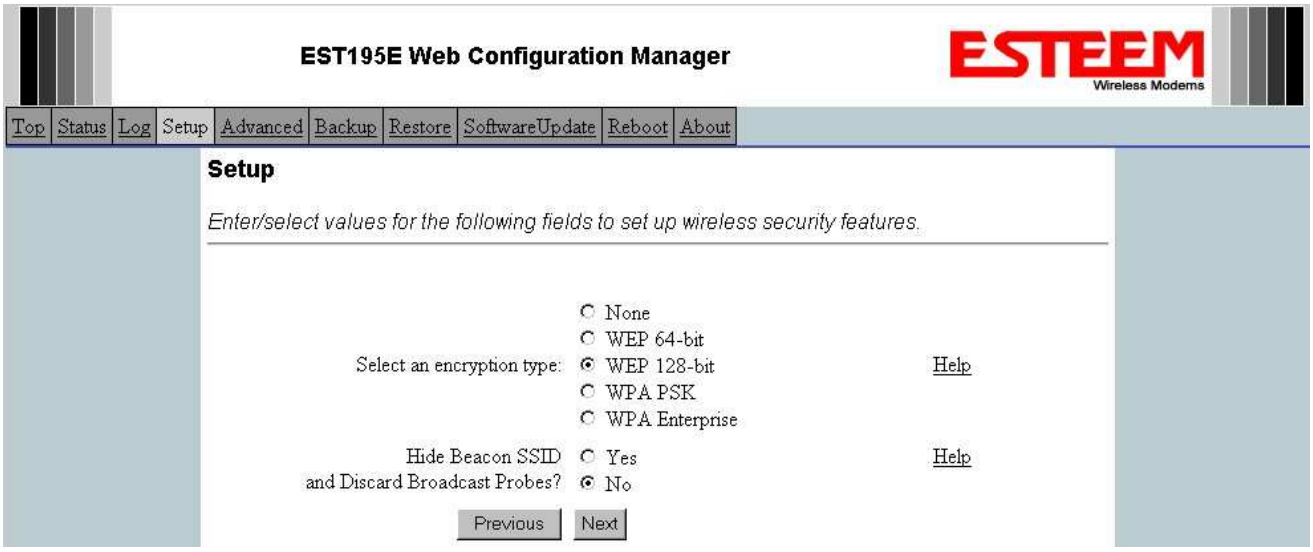


Figure 25: Encryption Level Selection

7. Enter the WEP key values for your application that will be used by all devices on the wireless network. Reference Figure 26.

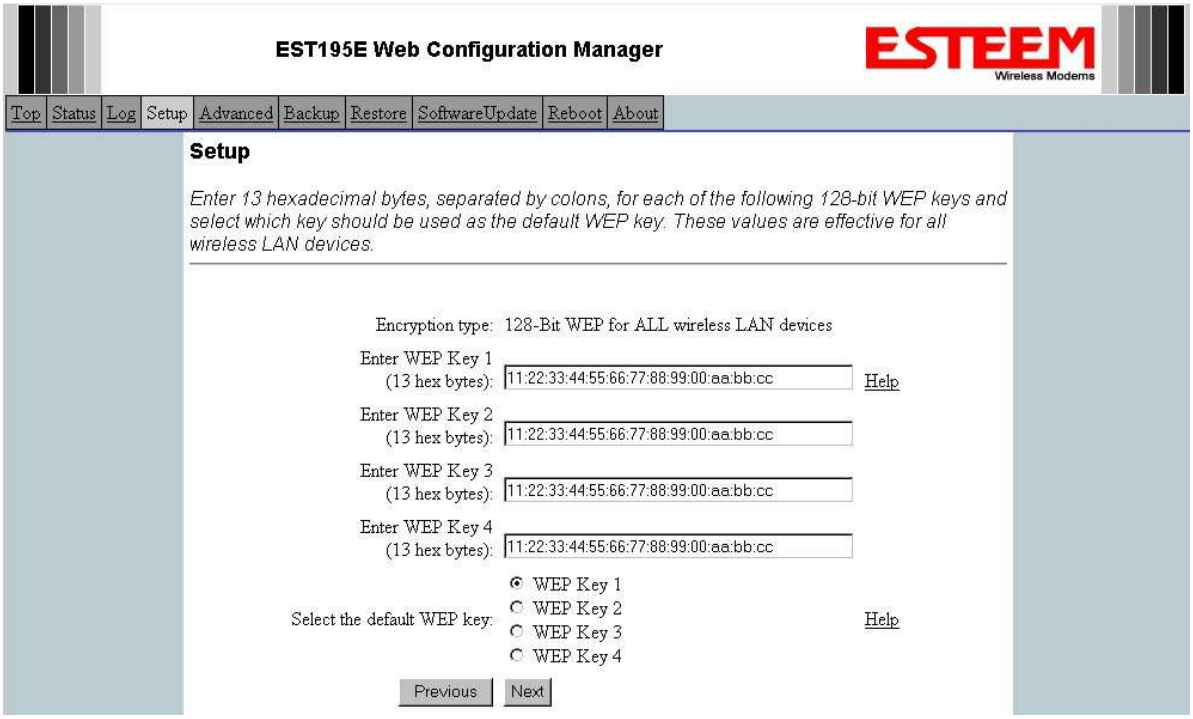

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
Enter 13 hexadecimal bytes, separated by colons, for each of the following 128-bit WEP keys and select which key should be used as the default WEP key. These values are effective for all wireless LAN devices.
Encryption type: 128-Bit WEP for ALL wireless LAN devices
Enter WEP Key 1 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Help
Enter WEP Key 2 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 3 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 4 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Select the default WEP key:
WEP Key 1
WEP Key 2
WEP Key 3
WEP Key 4
Help
Previous
Next

Figure 26: WEP Key Entry

8. Enter the values for the Access Control List (ACL). This is a configurable MAC filter that can be set to allow or deny specific wireless MAC address to the network. This feature is further explained in Appendix E – Security. In our example we will not use the ACL. Reference Figure 27.

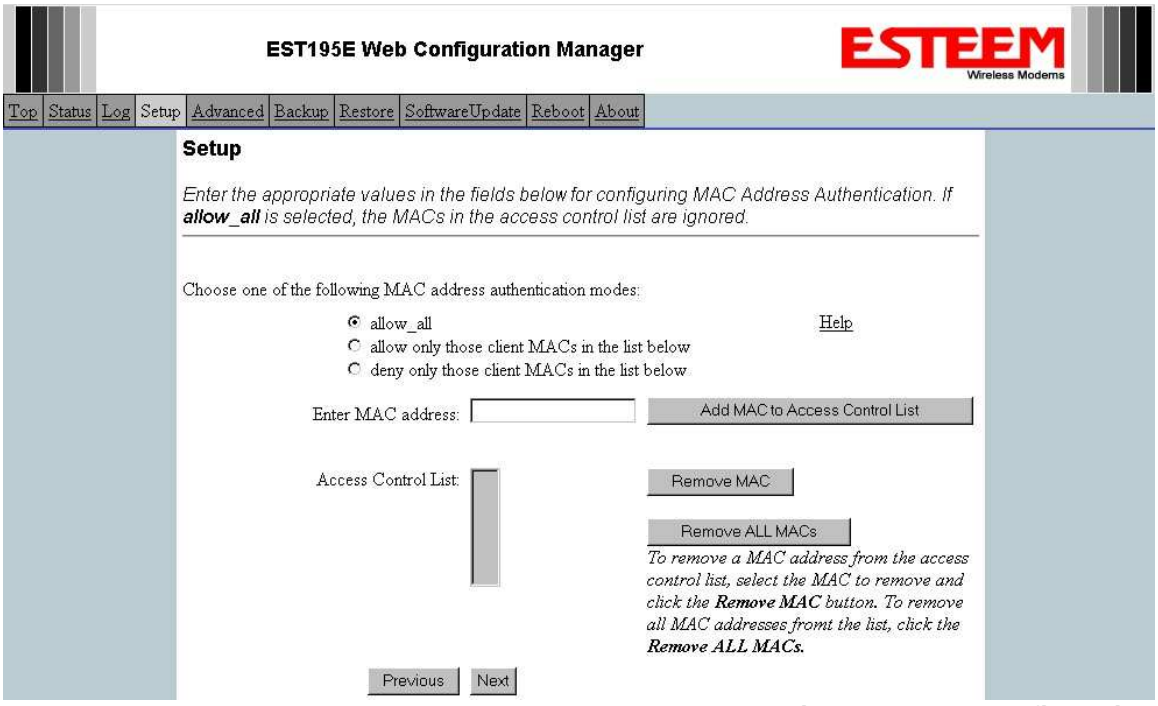

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
Enter the appropriate values in the fields below for configuring MAC Address Authentication. If allow_all is selected, the MACs in the access control list are ignored.
Choose one of the following MAC address authentication modes:
allow_all
allow only those client MACs in the list below
deny only those client MACs in the list below
Help
Enter MAC address:
Add MAC to Access Control List
Access Control List:
Remove MAC
Remove ALL MACs
To remove a MAC address from the access control list, select the MAC to remove and click the Remove MAC button. To remove all MAC addresses fromt the list, click the Remove ALL MACs.
Previous
Next

Figure 27: ACL Configuration

9. Select the frequency channel of operation. All Access Points in the same Repeater Peer network need to be on the same radio frequency channel. See Appendix D – Radio Configuration for help in selecting the frequency channel. Reference Figure 28.

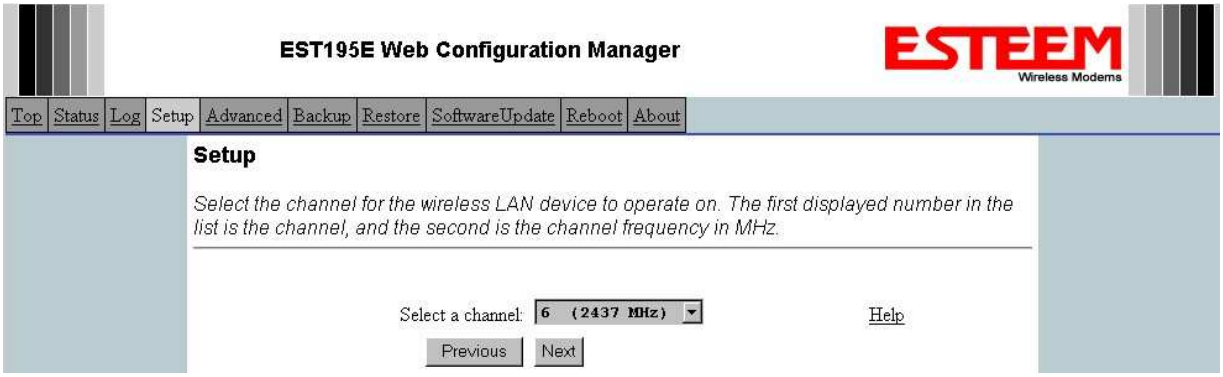


Figure 28: Channel Configuration

10. The Repeater Peer Table identifies which Model 195Eg's will bridge wireless Ethernet communication. Only other Access Point Repeaters need to be listed not the Model 195Eg's in client modes. Looking at the system layout in Figure 1 and what we discussed in Example 1, both the Plant Network's 195Eg and the Remote Building's 195Eg will be listed by their wireless (WLAN) MAC (Figure 29). There is only a single radio connection path to the other two 195Eg's in the network. The path cost only effects redundant links in the network (not applicable to the repeater) and will be left at default. Enter the WLAN MAC addresses for the other two Access Points and press the *Next* button to continue.
11. Select Commit Changes to write the programming to Flash memory and reboot the Model 195Eg. When the reboot process has completed (approximately 30 seconds) the modem will be ready to place in operation.

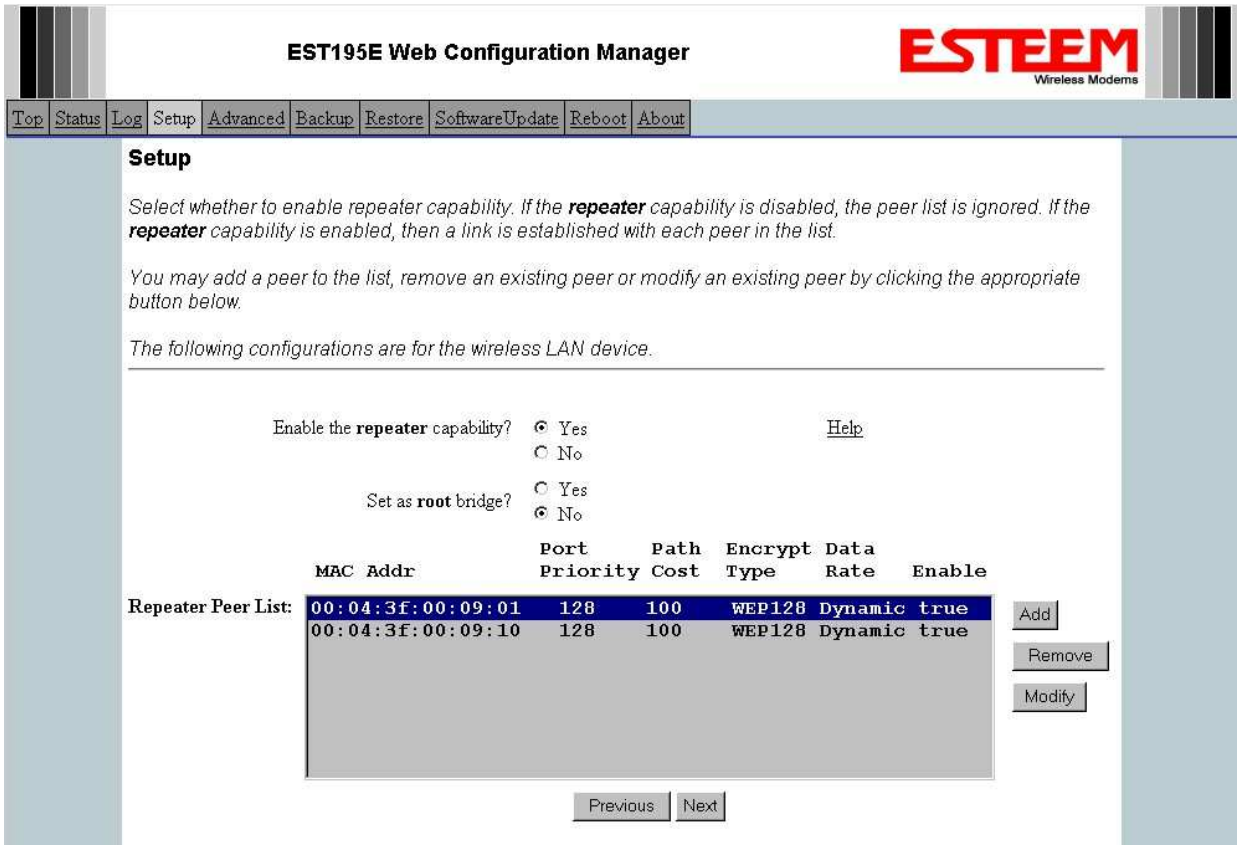


Figure 29: Repeater Configuration

Example 3 – Remote Building (Access Point Bridge with Repeater Enabled)

1. Review Example #1 diagram (Figure 1) and locate the 195Eg marked as Example 3. This ESTeem is connected to a Remote Building network that will be bridged to the Plant network through the Access Point Router (Example #1) via the repeater. This modem should be configured for Access Point Bridge mode and the configuration for this 195Eg will be identical to Example 2 except that the IP addressing and the Repeater Peer table. You would follow all steps 1-11 in Example 2 to configure this 195Eg also but Figures 31 & 32 will show the changes.

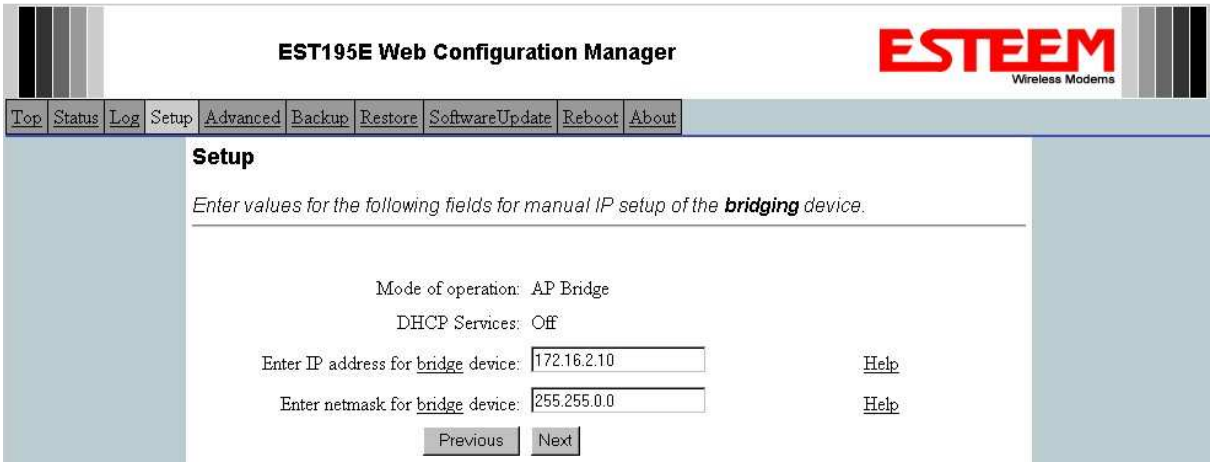


Figure 31: Example 3 Bridge IP Address

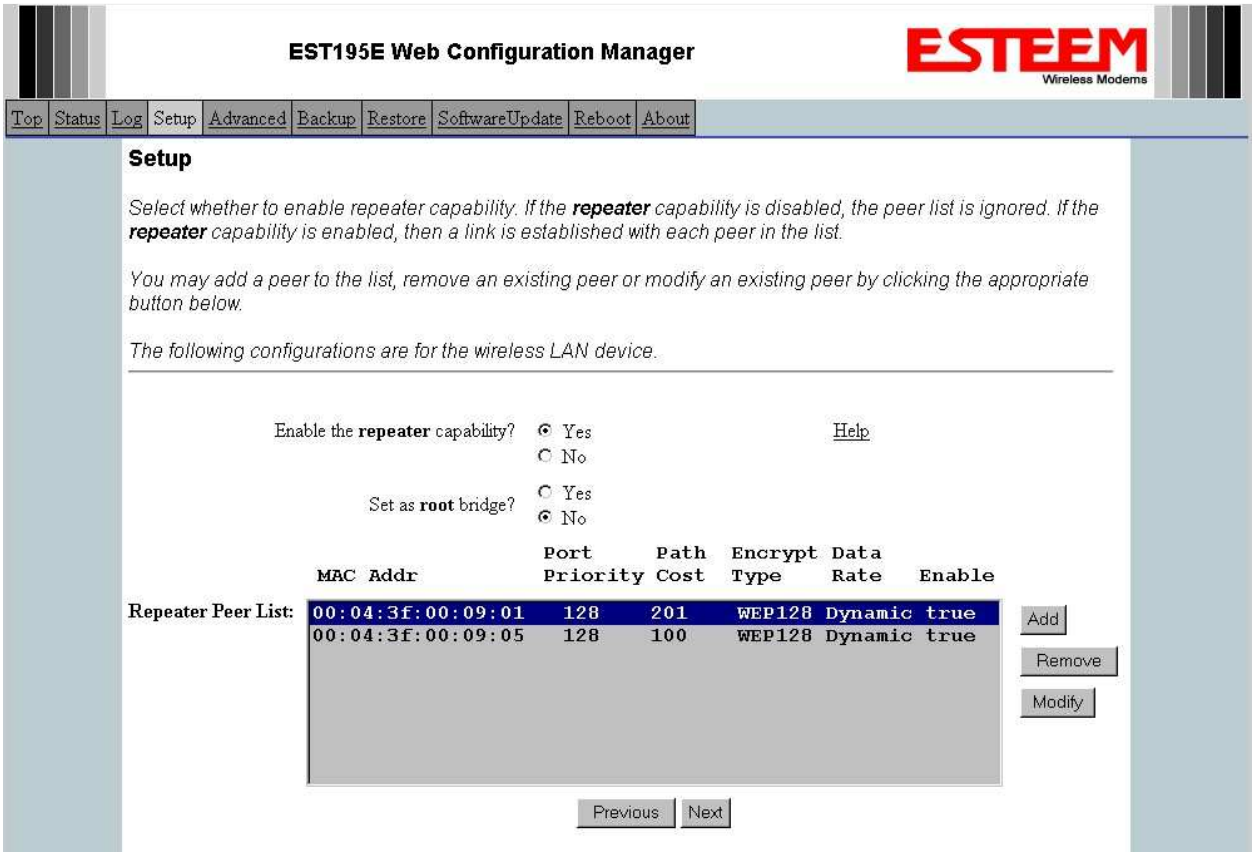


Figure 32: Example 3 Repeater Routing Table

Example 4 – Mobile Vehicle with Single Ethernet Device (EtherStation Mode)

Review the Example Diagram #1 (Figure 1) and locate the 195Eg marked as Example 4. This ESTeem is connected to a single Ethernet device in a mobile application and will be configured for EtherStation mode. In this mode the 195Eg will gain access to the wireless Ethernet canopy created by the three Access Points (Examples 1-3), but will be emulating the MAC address for the connected Ethernet device and will no longer have an IP address in the network. To reprogram the 195Eg after configuration in EtherStation mode requires the ESTeem Discovery Utility or direct connection to the RS-232 port.

1. Access the ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Setup from the menu items. From the Select Mode of Operation pull down box , select EtherStation (Figure 33) and push the *Next* button below the pull down box.

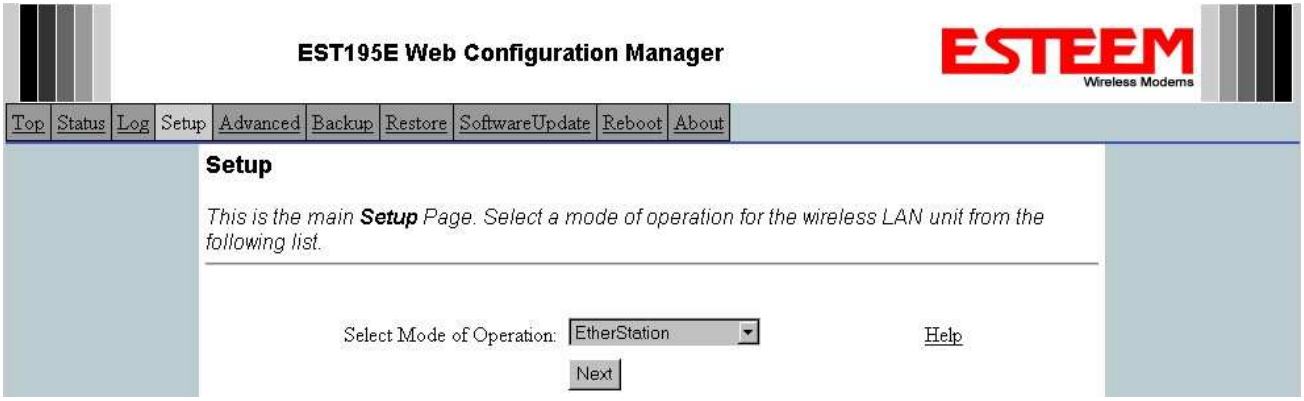


Figure 33: EtherStation Selection

2. Enter the SSID for you 802.11g network. The SSID is the unique identification for your wireless network and all 802.11g devices that share a wireless network MUST have the same SSID code. This identification code is case sensitive and must NOT contain spaces. Select the encryption level for the wireless network to match the level of the Access Point canopy. Enter the MAC address of the connected Ethernet device. Reference Figure 34.

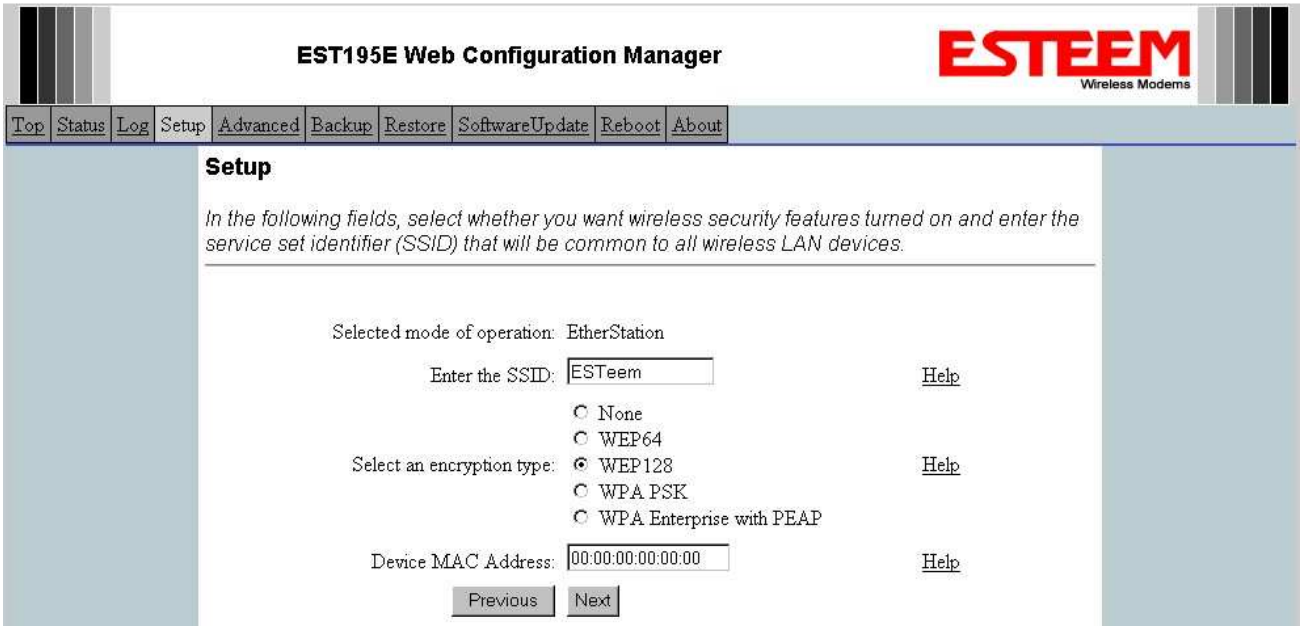


Figure 34: SSID and Device MAC Input

3. Enter the WEP key values for your application that will be used by all devices on the wireless network. Reference Figure 35.

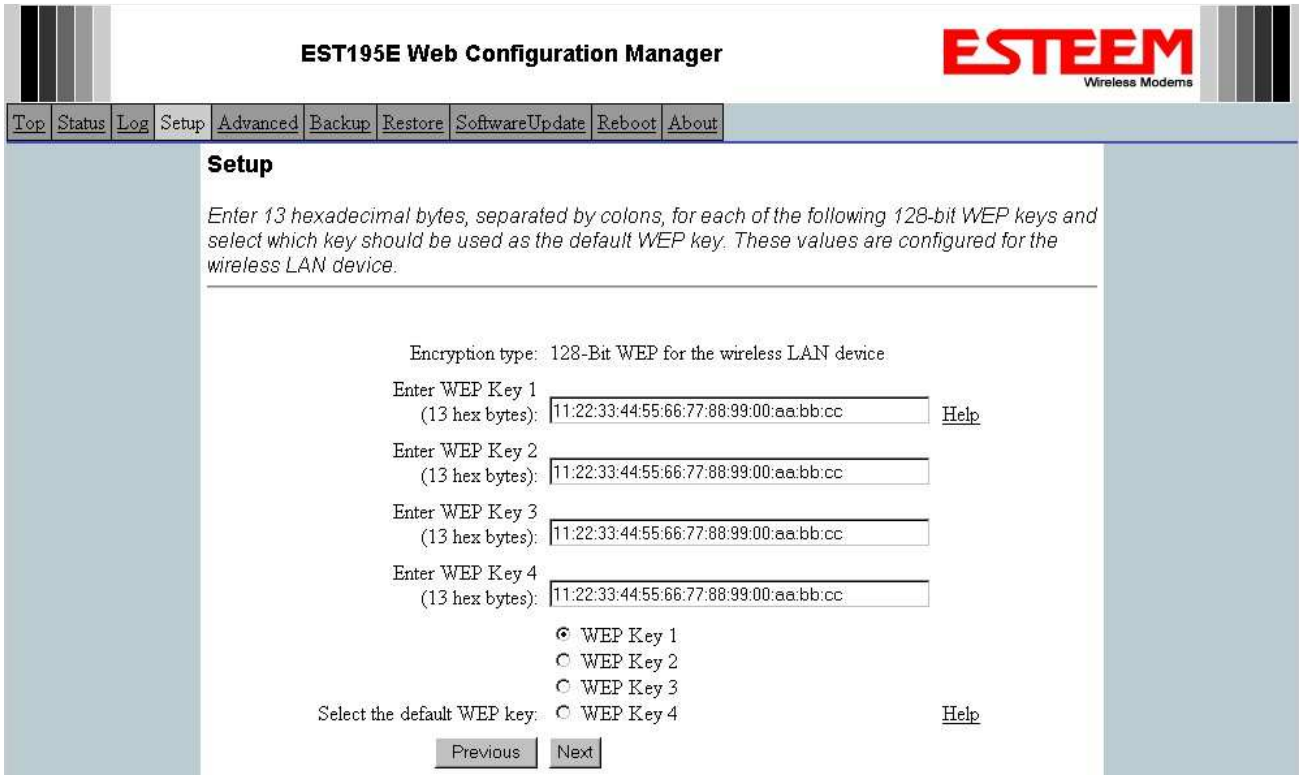

EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter 13 hexadecimal bytes, separated by colons, for each of the following 128-bit WEP keys and select which key should be used as the default WEP key. These values are configured for the wireless LAN device.
Encryption type: 128-Bit WEP for the wireless LAN device
Enter WEP Key 1 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc Help
Enter WEP Key 2 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 3 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 4 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Select the default WEP key: WEP Key 1 WEP Key 2 WEP Key 3 WEP Key 4 Help
Previous Next

Figure 35: WEP Key Input

4. Select Commit Changes to write the programming to Flash memory and reboot the Model 195Eg. When the reboot process has completed (approximately 30 seconds) the modem will be ready to place in operation. Reference Figure 36.

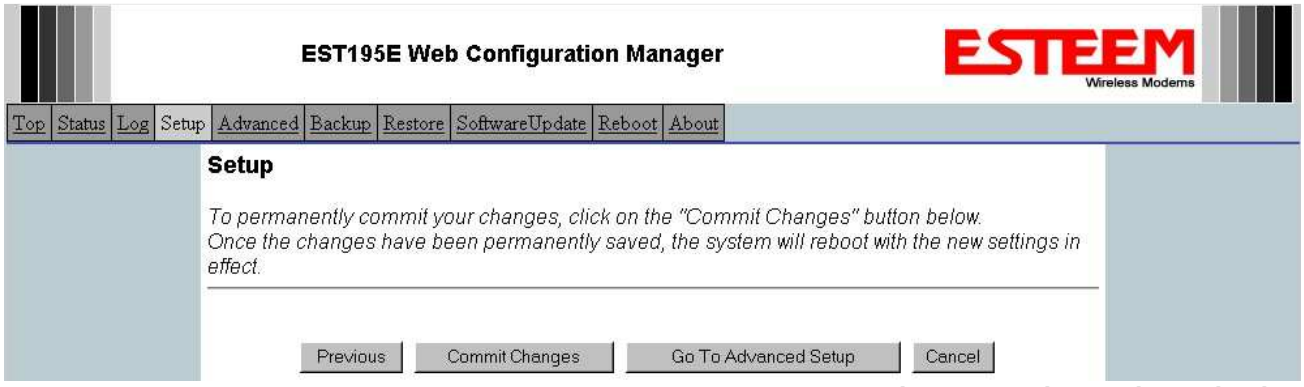

EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
To permanently commit your changes, click on the "Commit Changes" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Previous Commit Changes Go To Advanced Setup Cancel

Figure 36: EtherStation Selection

Example 5 – Mobile Vehicle #1 (Station Router)

Review the Example Diagram #2 (Figure 2) and locate the 195Eg marked as Example 5. This ESTeem is connected to multiple Ethernet devices in a mobile application and will be configured Station Router mode. In this mode the 195Eg's will gain access to the wireless Ethernet canopy created by the Access Point and act as the router between the devices connected to the Ethernet port and wireless network. Each of these networks will require a unique subnet to operate. If Ethernet devices on the wired LAN network want to access Ethenet devices on the Station Router 195Eg, a network router is required on the wired LAN to resolve the IP conflict created by having the wired and wireless networks on separate subnets (Figure 37).

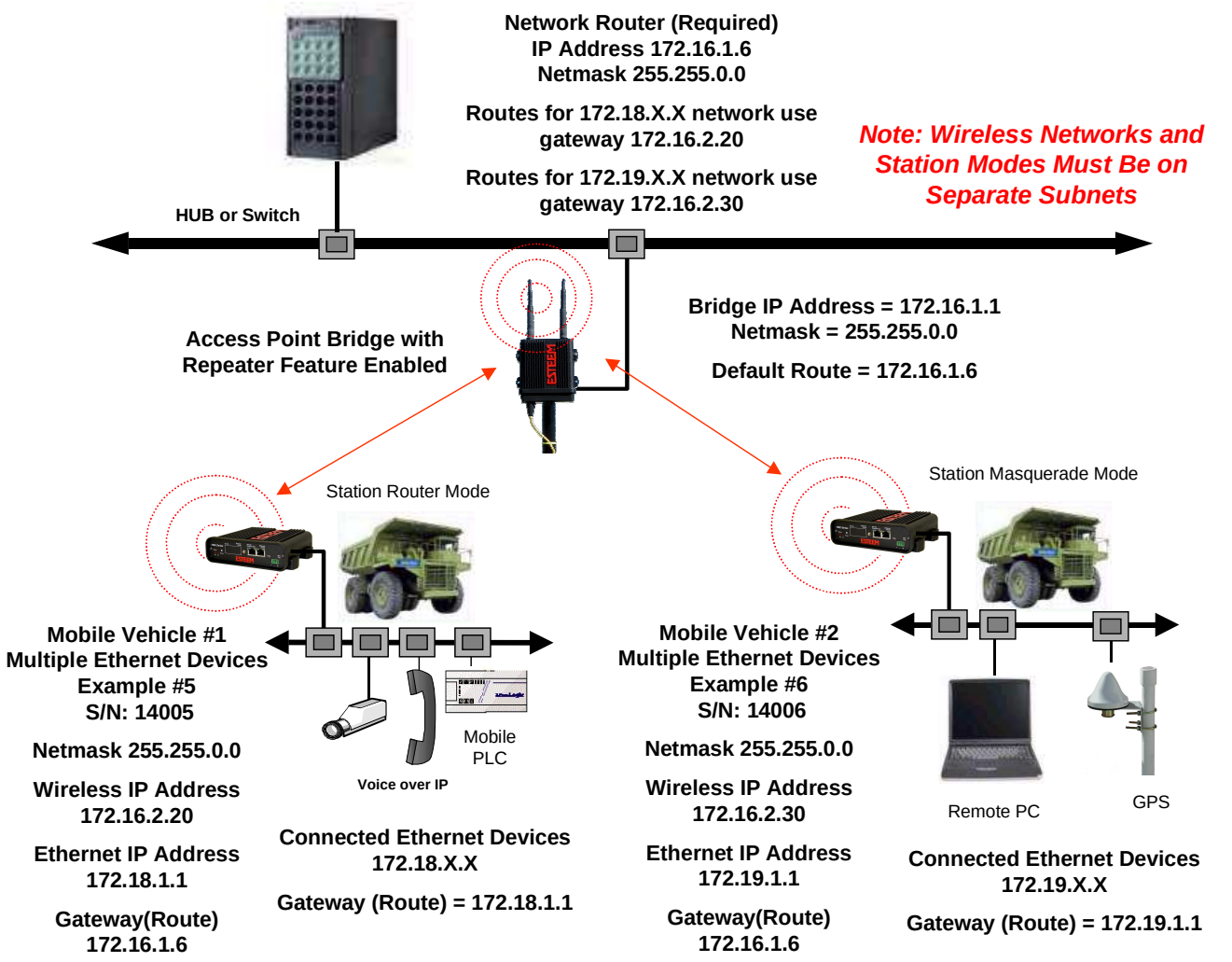


Figure 37: Station Router IP Addressing Diagram

1. Access the ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Setup from the menu items. From the Select Mode of Operation pull down box , select Station Router (Figure 38) and push the *Next* button below the pull down box.

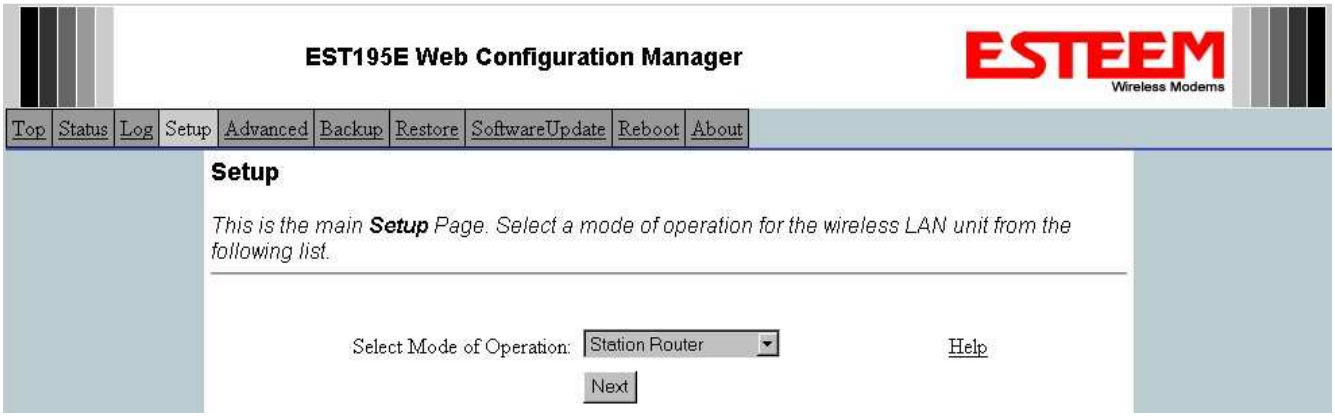


Figure 38:Station Router Selection

2. Select *Yes* if you would like to use DHCP services on either the **wireless** or **ethernet** connections. Enter the SSID for you 802.11g network. The SSID is the unique identification for your wireless network and all 802.11g devices that share a wireless network MUST have the same SSID code. This identification code is case sensitive and must NOT contain spaces. Select the encryption level for the wireless network to match the level of the Access Point canopy. Reference Figure 39.

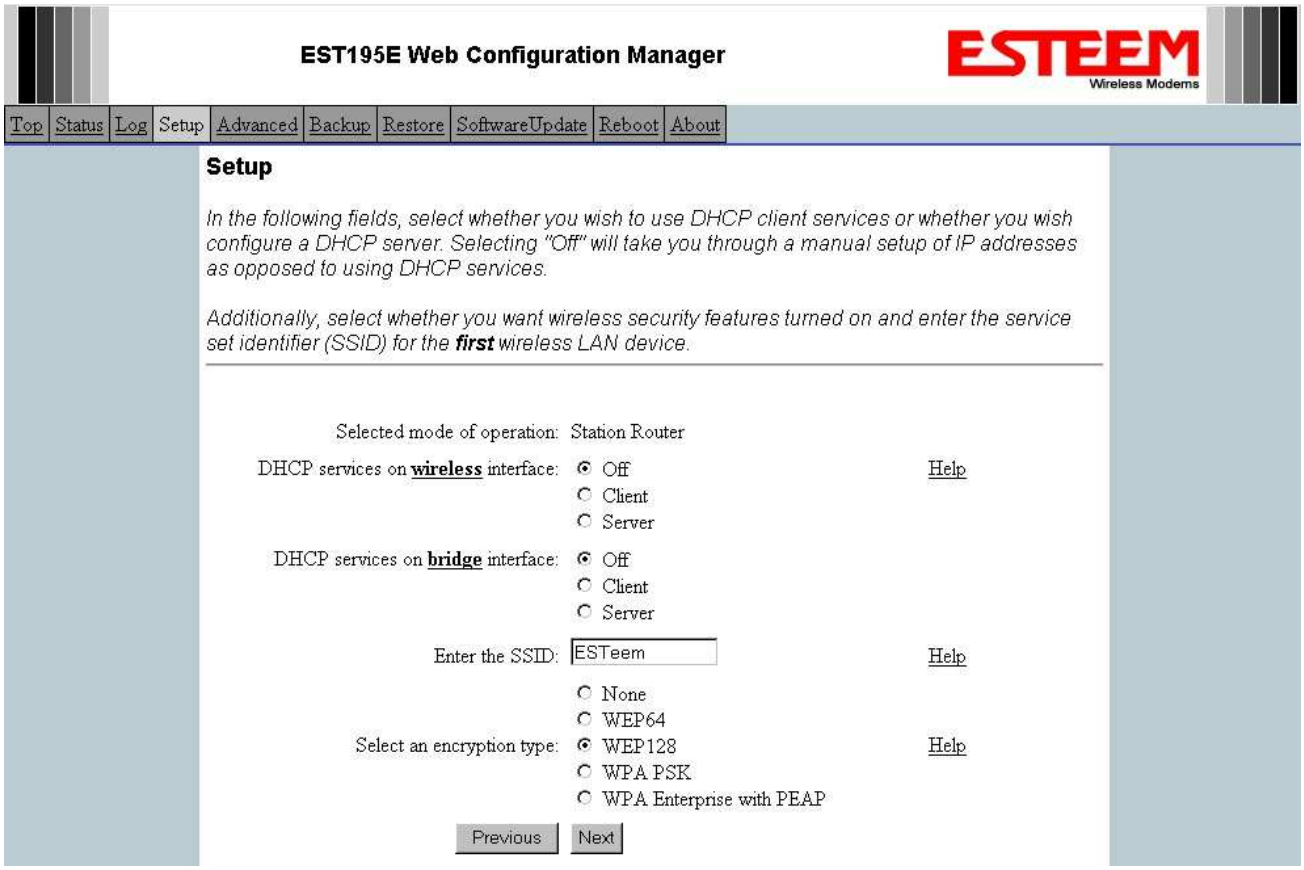

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
In the following fields, select whether you wish to use DHCP client services or whether you wish configure a DHCP server. Selecting "Off" will take you through a manual setup of IP addresses as opposed to using DHCP services.
Additionally, select whether you want wireless security features turned on and enter the service set identifier (SSID) for the first wireless LAN device.
Selected mode of operation: Station Router
DHCP services on wireless interface: Off Client Server
Help
DHCP services on bridge interface: Off Client Server
Enter the SSID: ESTeem
Help
Select an encryption type: None WEP64 WEP128 WPA PSK WPA Enterprise with PEAP
Help
Previous
Next

Figure 39:DHCP, SSID and Encryption Settings

3. Enter the WEP key values for your application that will be used by all devices on the wireless network. Reference Figure 40.

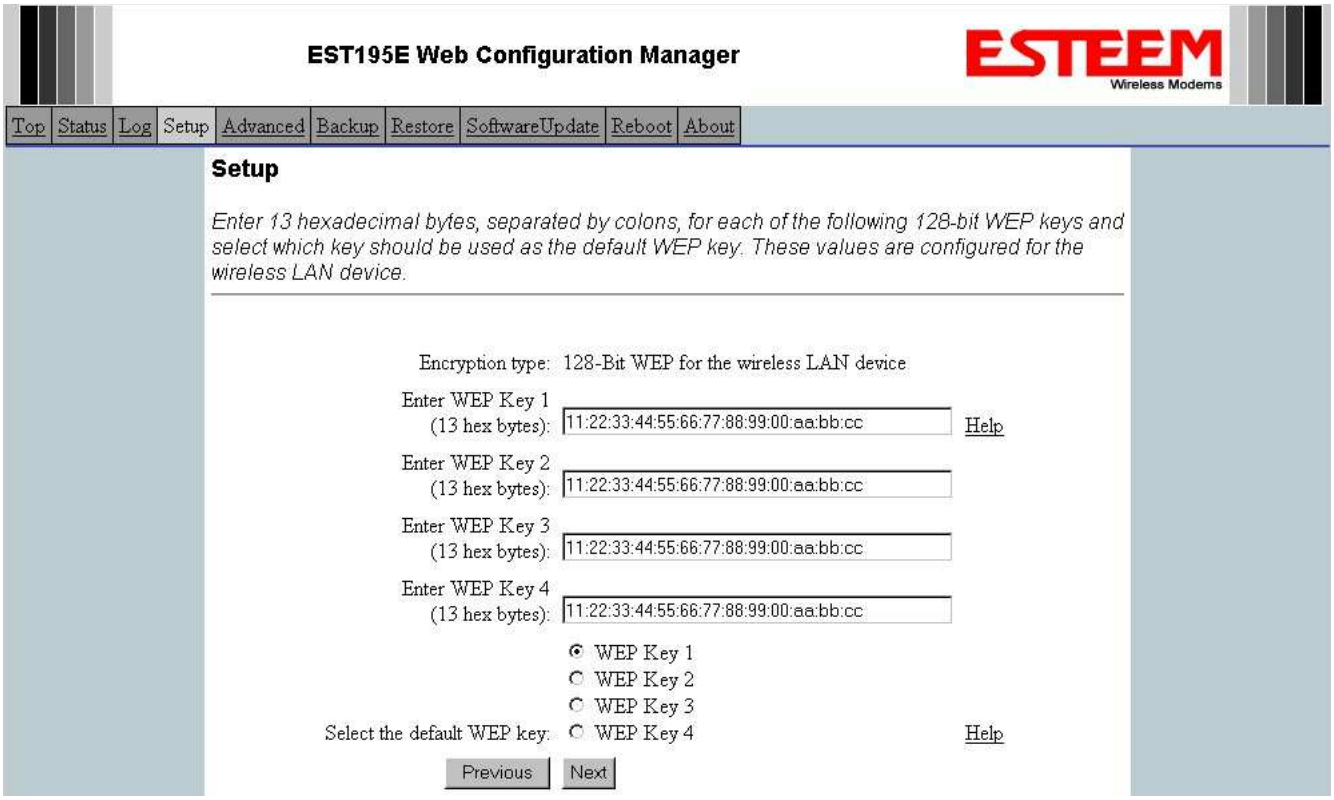

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter 13 hexadecimal bytes, separated by colons, for each of the following 128-bit WEP keys and select which key should be used as the default WEP key. These values are configured for the wireless LAN device.
Encryption type: 128-Bit WEP for the wireless LAN device
Enter WEP Key 1 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc Help
Enter WEP Key 2 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 3 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 4 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
WEP Key 1
WEP Key 2
WEP Key 3
Select the default WEP key: WEP Key 4 Help
Previous Next

Figure 40:WEP Key Input

4. Refer to the IP address in Table 1 and enter the **wireless** IP Address and IP Netmask for the Station Router. Reference Figure 41.

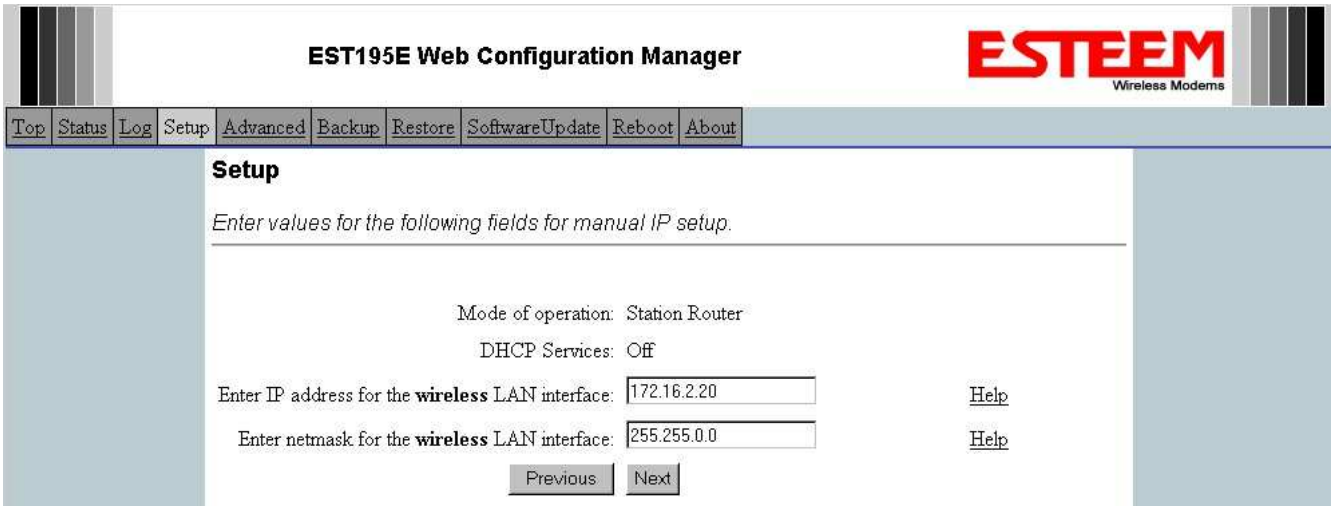

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter values for the following fields for manual IP setup.
Mode of operation: Station Router
DHCP Services: Off
Enter IP address for the wireless LAN interface: 172.16.2.20 Help
Enter netmask for the wireless LAN interface: 255.255.0.0 Help
Previous Next

Figure 41:Wireless IP Address

5. Refer to the IP address in Table 1 and enter the **ethernet** IP address and IP netmask. Reference Figure 42.

*Note: When configuring the Ethernet devices connected to the Station Router 195Eg, the ethernet IP address will be **their** Gateway address (Figure 37).*

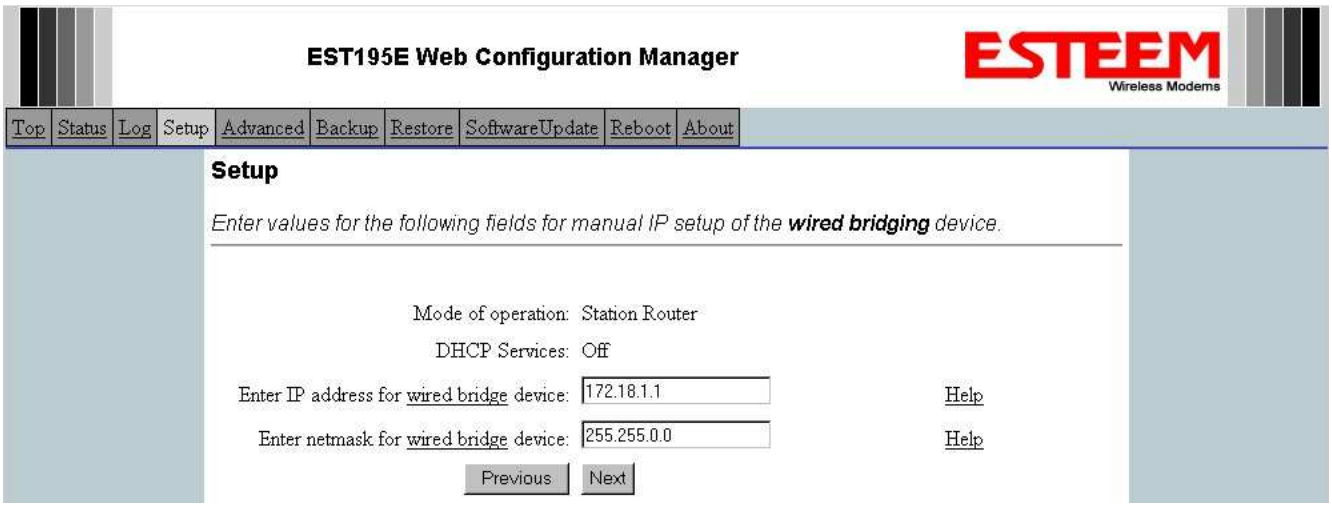


Figure 42:Wired Ethernet IP Address

6. All IP requests for the Ethernet devices connected to the 195Eg Station Router (Example #5) will need to be resolved by the Network Router (Figure 37). Enter the default route (Gateway) IP address for the Network Router in the 195Eg. Enter any DNS server information and press the *Next* button. Figure 43.

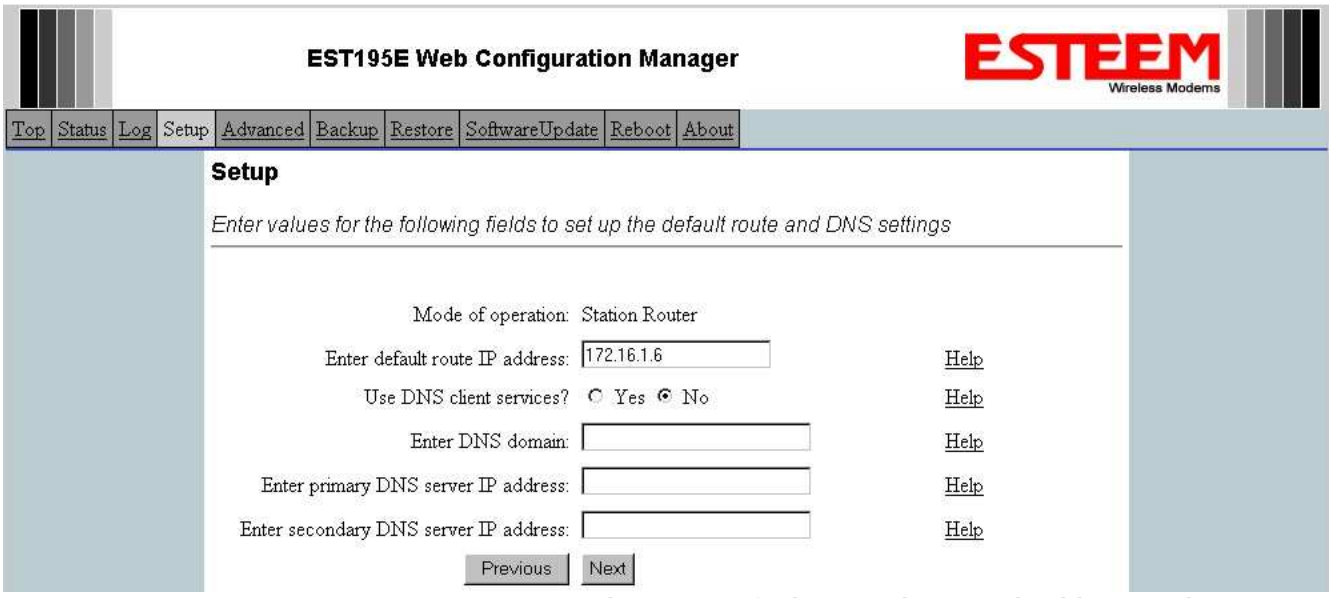


Figure 43:Default Route (Gateway) Address and DNS Input

7. Select *Commit Changes* to write the programming to Flash memory and reboot the Model 195Eg. When the reboot process has completed (approximately 30 seconds) the modem will be ready to place in operation.

Example 6 – Mobile Vehicle #2 (Station Masquerade)

Review the Example Diagram #2 (Figure 2) and locate the 195Eg marked as Example 6. This ESTeem is connected to multiple Ethernet devices in a mobile application and will be configured Station Masquerade mode. In this mode the 195Eg's will gain access to the wireless Ethernet canopy created by the Access Point and act as a firewall between the devices connected to the Ethernet port and wireless network. Each of these networks will require a unique subnet to operate. In this configuration the Ethernet devices connected to the Station Masquerade 195Eg can access the wired LAN network, but not the other way around. This mode could be used if the Remote PC connected to the Station Masquerade needed to access the Internet (connected to the wired LAN), but did not want to be seen by other Ethernet devices on the network.

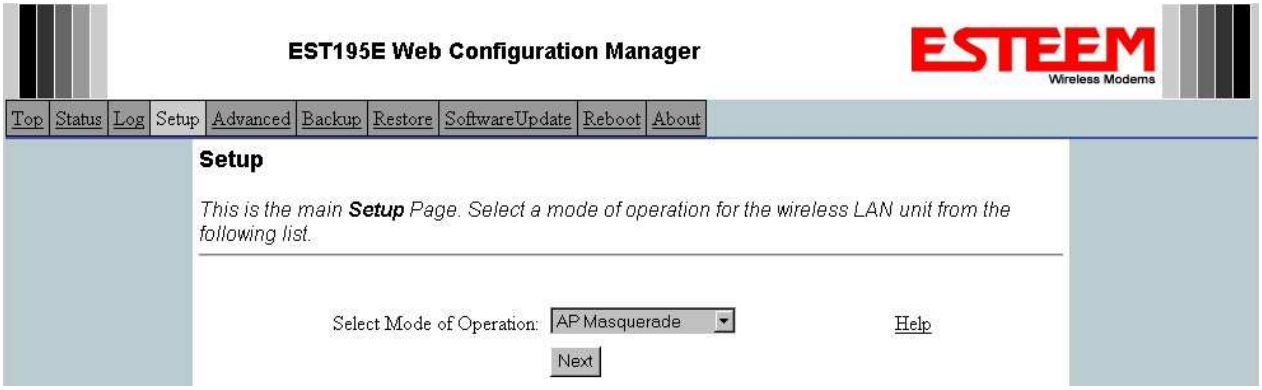


Figure 44:Station Masquerade Selection

1. Access the ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Setup from the menu items. From the Select Mode of Operation pull down box , select Station Masquerade (Figure 44) and push the *Next* button below the pull down box.

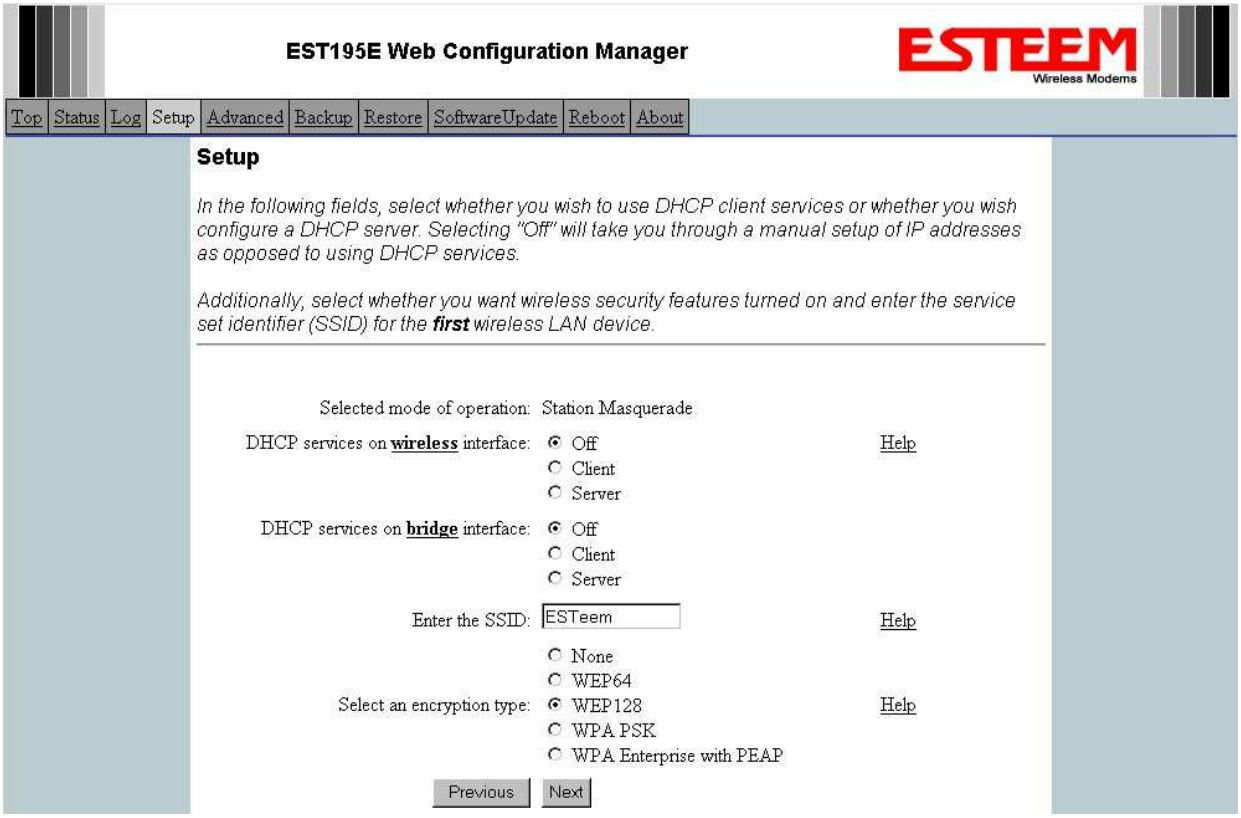


Figure 45:DHCP, SSID and Encryption Settings

2. Select *Yes* if you would like to use DHCP services on either the **wireless** or **ethernet** connections. Enter the SSID for you 802.11g network. The SSID is the unique identification for your wireless network and all 802.11g devices that share a wireless network MUST have the same SSID code. This identification code is case sensitive and must NOT contain spaces. Select the encryption level for the wireless network to match the level of the Access Point canopy. Reference Figure 45.

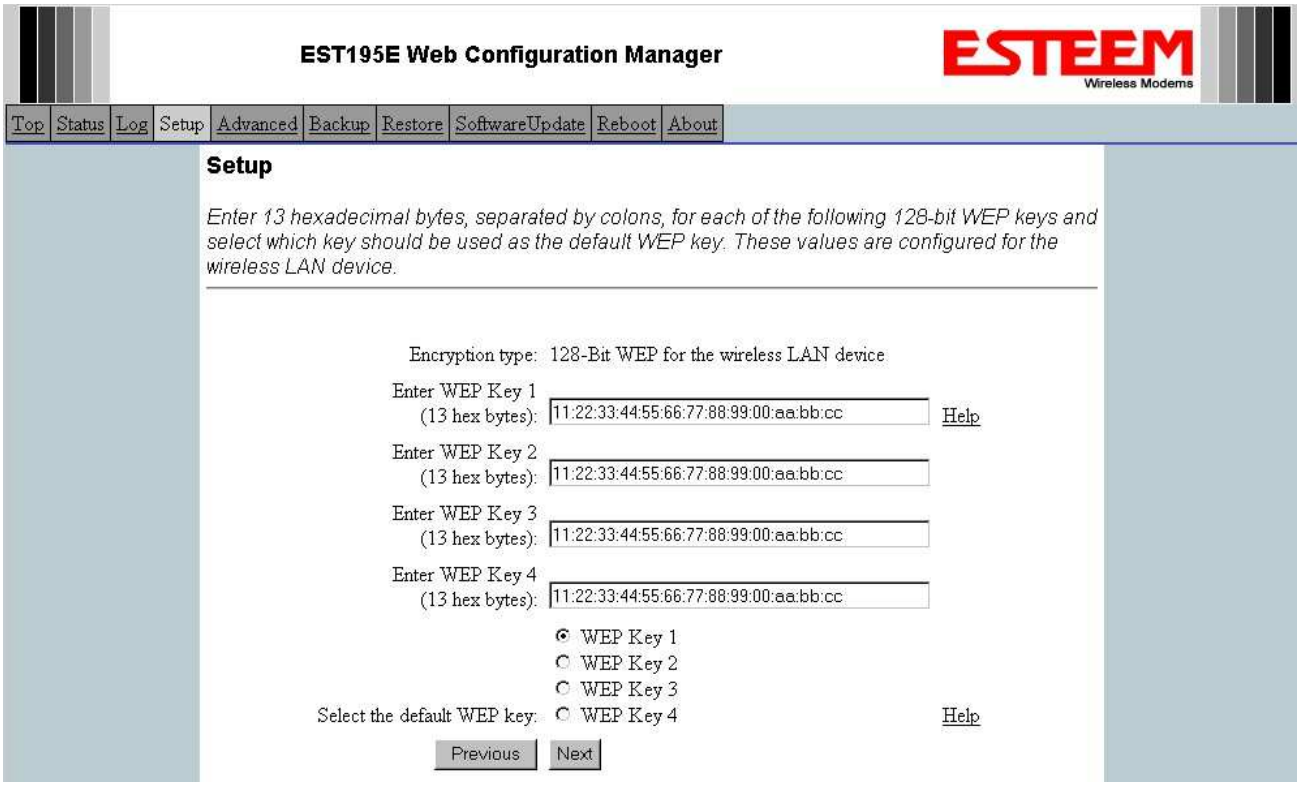

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
Enter 13 hexadecimal bytes, separated by colons, for each of the following 128-bit WEP keys and select which key should be used as the default WEP key. These values are configured for the wireless LAN device.
Encryption type: 128-Bit WEP for the wireless LAN device
Enter WEP Key 1 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Help
Enter WEP Key 2 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 3 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
Enter WEP Key 4 (13 hex bytes): 11:22:33:44:55:66:77:88:99:00:aa:bb:cc
WEP Key 1
WEP Key 2
WEP Key 3
Select the default WEP key: WEP Key 4
Help
Previous
Next

Figure 46:WEP Key Entry

3. Enter the WEP key values for your application that will be used by all devices on the wireless network. Reference Figure 46.

4. Refer to the IP address in Table 1 and enter the **wireless** IP Address and IP Netmask for the Station Router. Reference Figure 47.

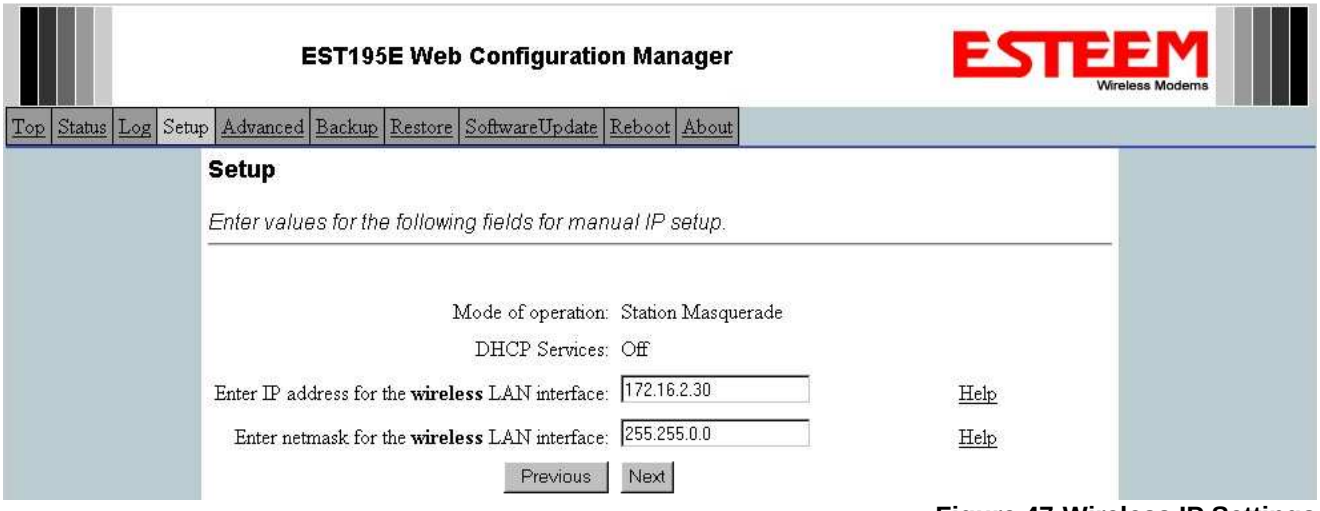


Figure 47:Wireless IP Settings

5. Refer to the IP address in Table 1 and enter the **ethernet** IP address and IP netmask. Reference Figure 48.

*Note: When configuring the Ethernet devices connected to the Station Router 195Eg, the ethernet IP address will be **their** Gateway address (Figure 37).*

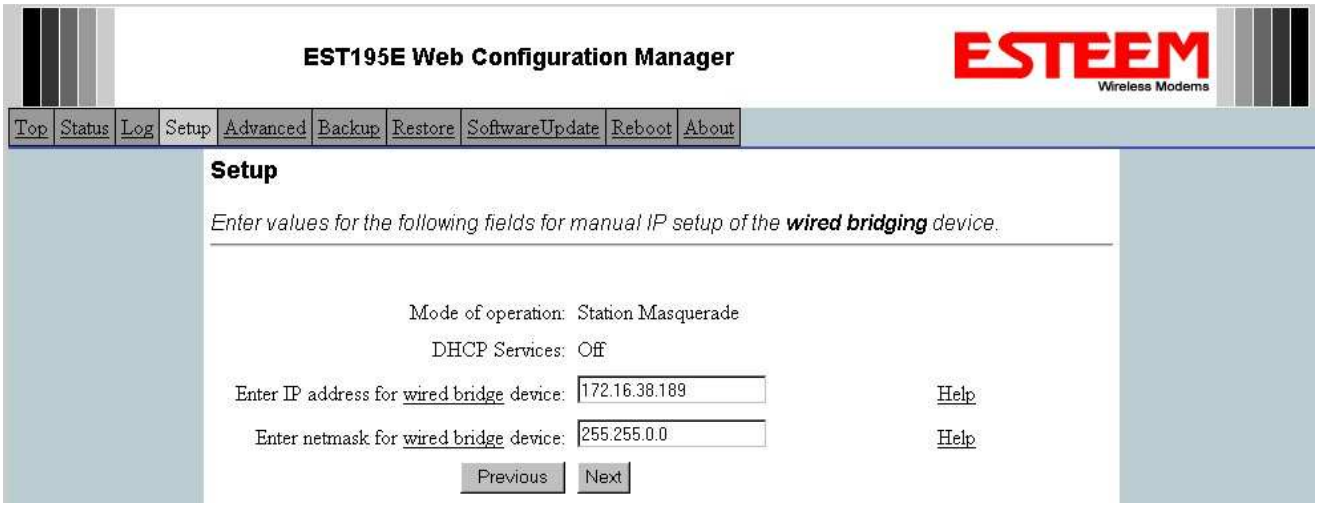


Figure 48:Wired Ethernet Interface

6. All IP requests for the Ethernet devices connected to the 195Eg Station Router (Example #5) will need to be resolved by the Network Router (Figure 37). Enter the default route (Gateway) IP address for the Network Router in the 195Eg. Enter any DNS server information and press the *Next* button. Figure 49.

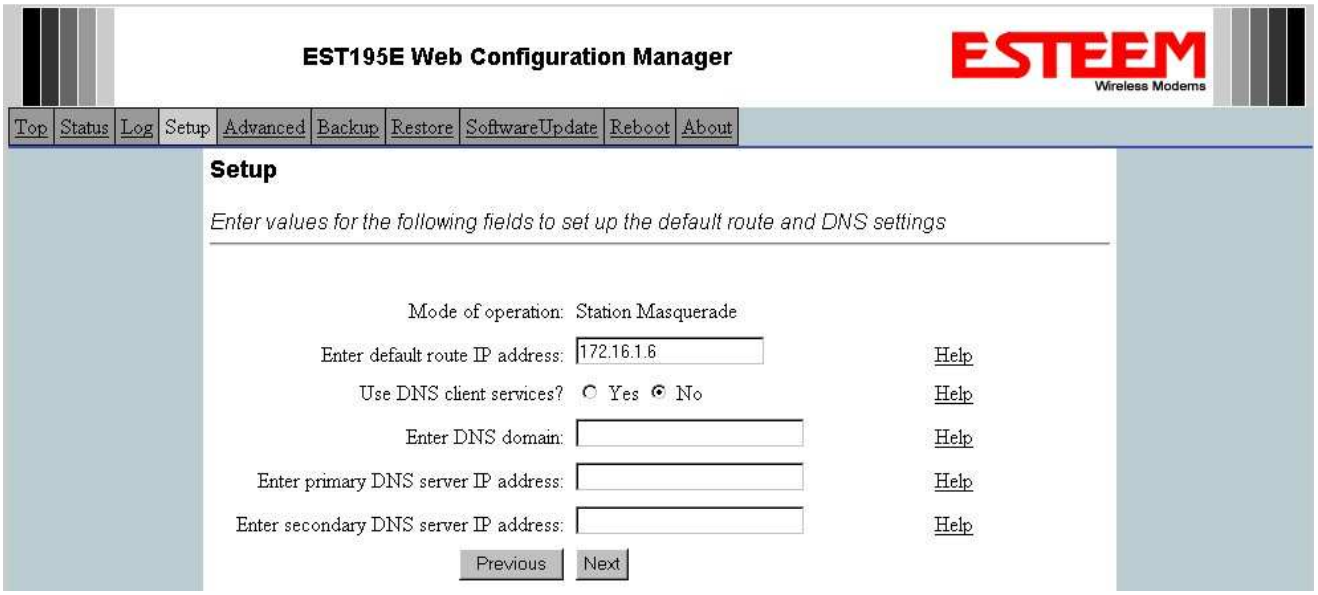


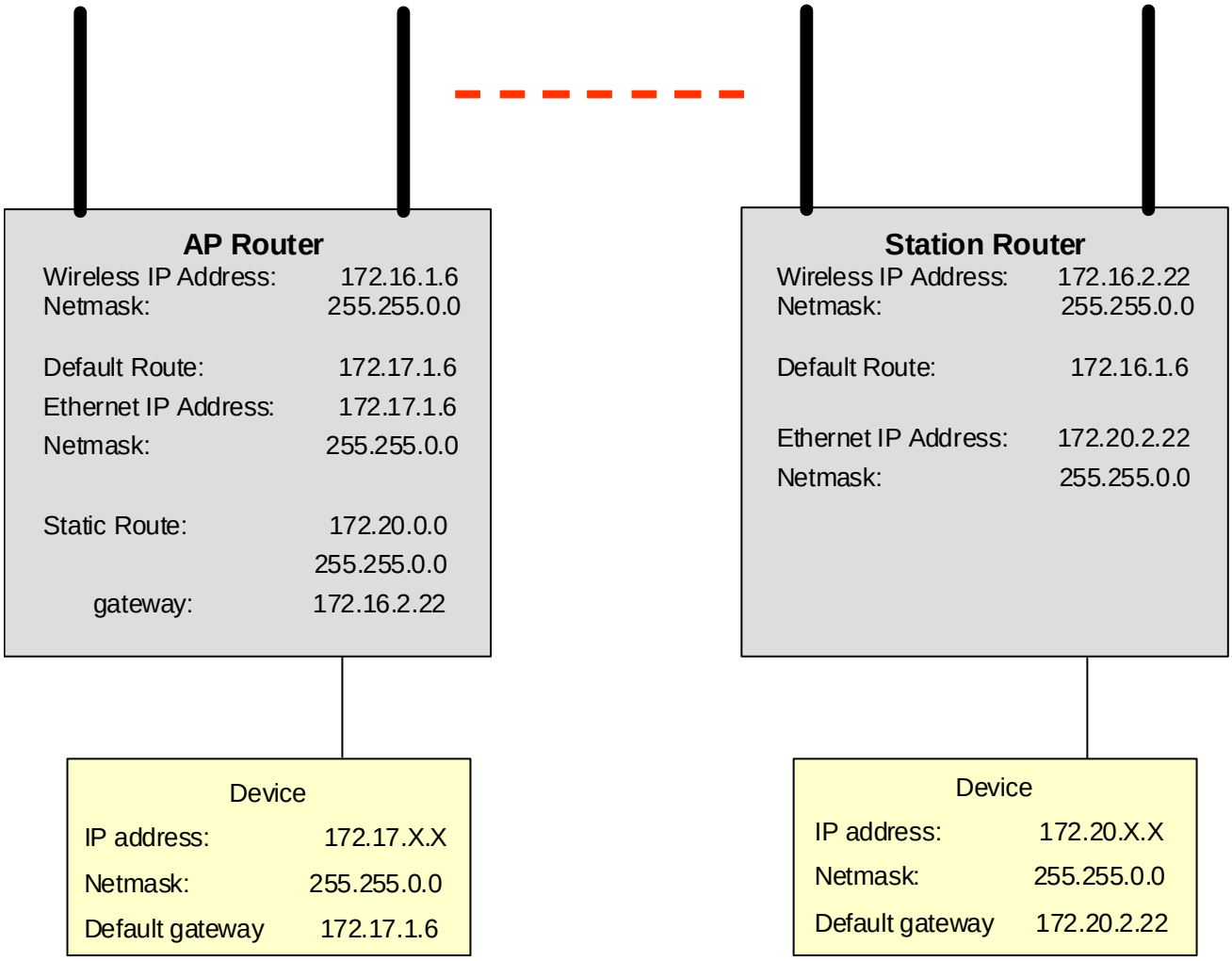
Figure 49:Default Route (Gateway) and DNS Input

7. Select *Commit Changes* to write the programming to Flash memory and reboot the Model 195Eg. When the reboot process has completed (approximately 30 seconds) the modem will be ready to place in operation.

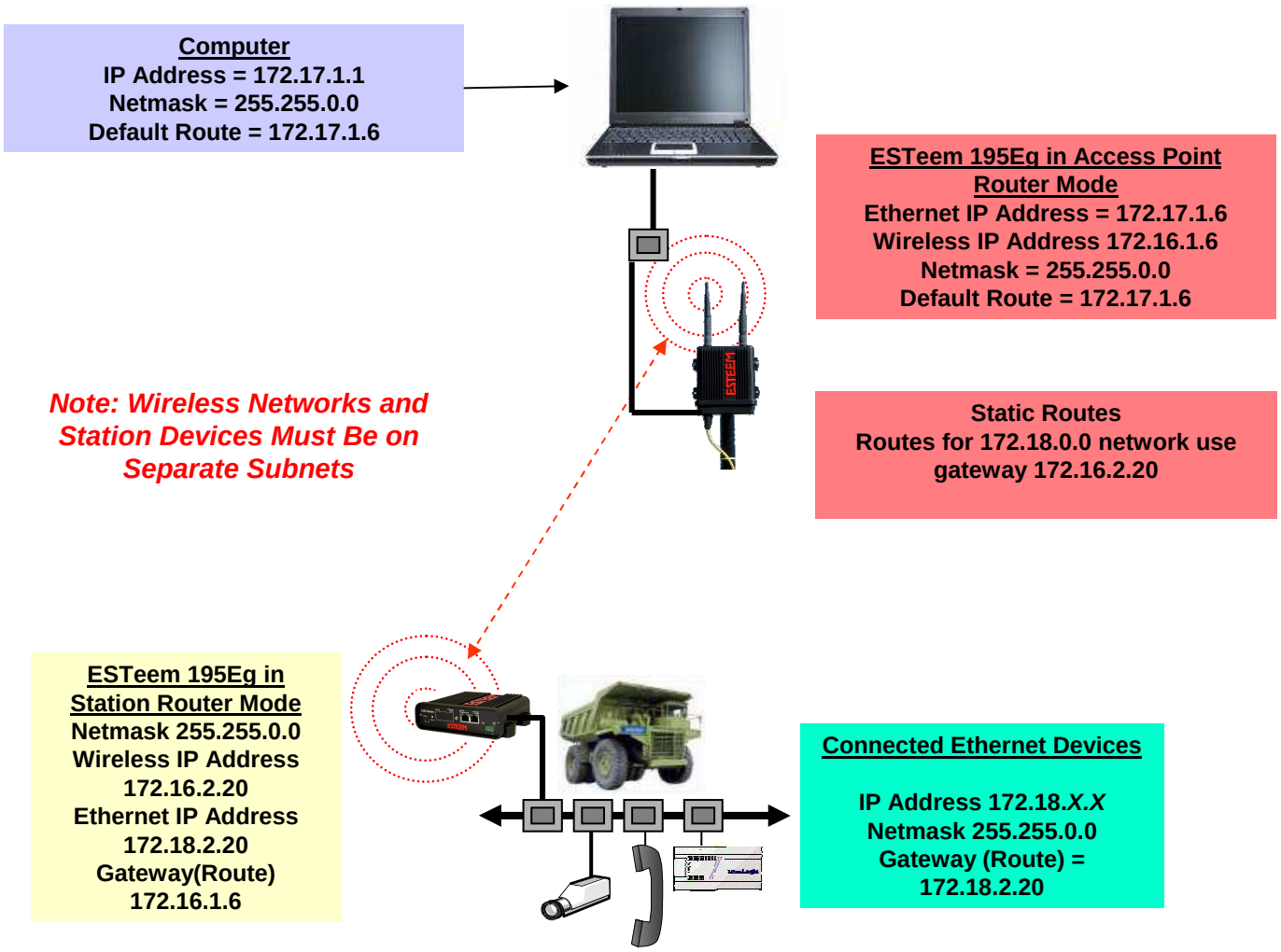
ROUTER ADDRESSING EXAMPLES

The following are examples of the IP addressing and subnets required for the ESTeem Router modes.

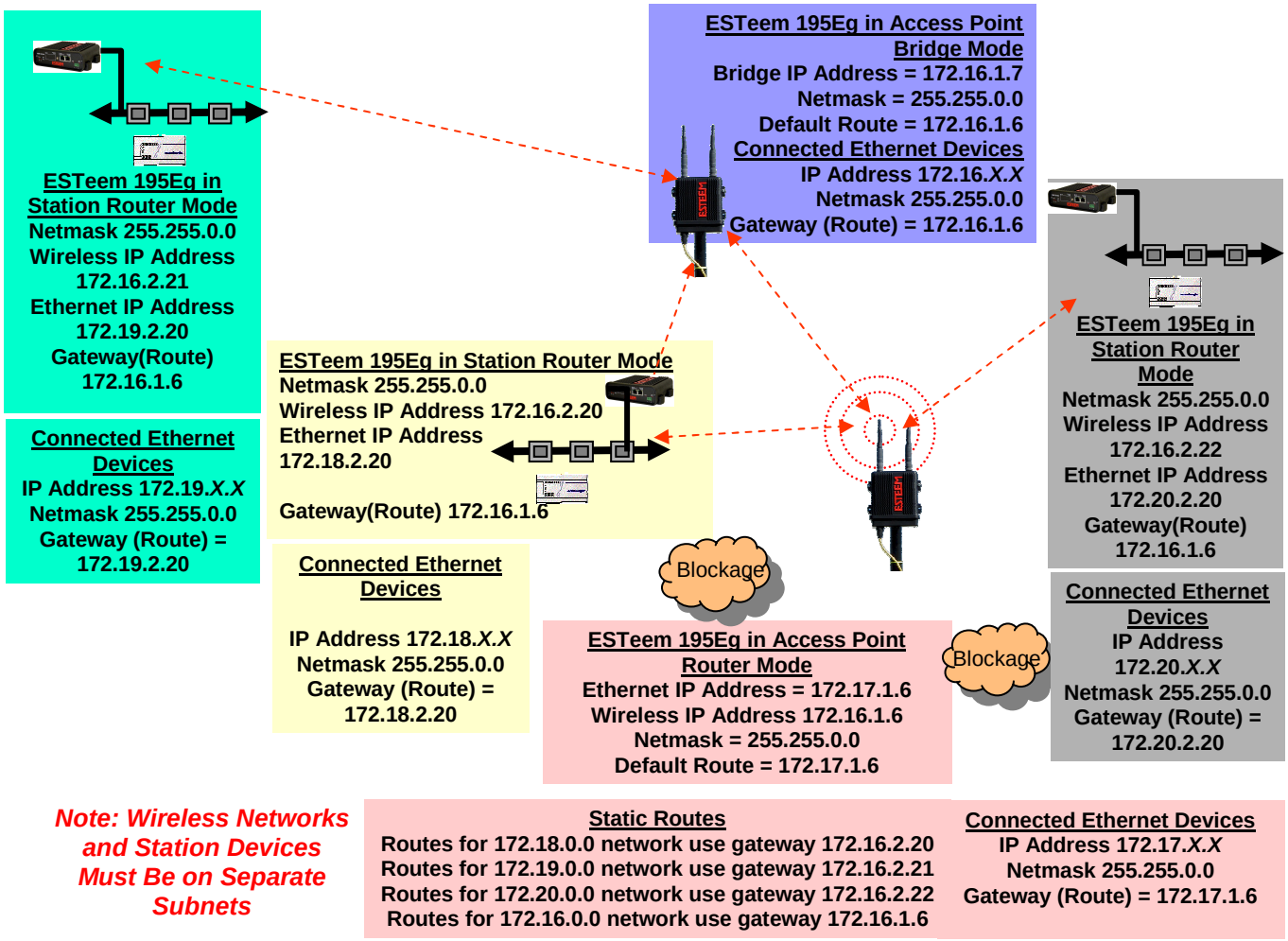
Point to Point Access Point Router to Station Router



Stand-Alone Access Point Router and Single Station Router


Computer
IP Address = 172.17.1.1
Netmask = 255.255.0.0
Default Route = 172.17.1.6
ESTeem 195Eg in Access Point Router Mode
Ethernet IP Address = 172.17.1.6
Wireless IP Address 172.16.1.6
Netmask = 255.255.0.0
Default Route = 172.17.1.6
Note: Wireless Networks and Station Devices Must Be on Separate Subnets
Static Routes
Routes for 172.18.0.0 network use gateway 172.16.2.20
ESTeem 195Eg in Station Router Mode
Netmask 255.255.0.0
Wireless IP Address 172.16.2.20
Ethernet IP Address 172.18.2.20
Gateway(Route) 172.16.1.6
Connected Ethernet Devices
IP Address 172.18.X.X
Netmask 255.255.0.0
Gateway (Route) = 172.18.2.20

Stand-Alone Access Point Router with Multiple Station Routers



Note: Wireless Networks and Station Devices Must Be on Separate Subnets

Static Routes
Routes for 172.18.0.0 network use gateway 172.16.2.20
Routes for 172.19.0.0 network use gateway 172.16.2.21
Routes for 172.20.0.0 network use gateway 172.16.2.22
Routes for 172.16.0.0 network use gateway 172.16.1.6

Connected Ethernet Devices
IP Address 172.17.X.X
Netmask 255.255.0.0
Gateway (Route) = 172.17.1.6

CHAPTER 6
SERIAL APPLICATIONS

The ESTeem 195Eg is now available with an optional factory installed serial port that can provide RS-232 communication between two or more serial devices using the wireless broadband link. The serial data is encapsulated and transferred as a standard Ethernet packet over an operating 195Eg wireless Ethernet system. The configuration for a serial 195Eg network will be the same as an Ethernet or a serial (RS-232) based communication network.

The serial interface option can be used to link two or more serial devices in a new or existing system. The serial data has very little impact on the network bandwidth and will allow for both Ethernet and serial applications simultaneously. A few possible applications would be installation of the 195Eg in an existing serial based network that was looking for future upgrade to an Ethernet based system. Another would be using the high-bandwidth Ethernet connections to provide a link to remote video hardware but also provide a serial link to the existing PLC in a SCADA type application.

SERIAL CONNECTIONS

The RJ-45 serial data port is the far-left port on face of the 195Eg (Figure 1). Using the ESTeem AA0621 interface cable, the 195Eg can be connected to a standard DTE-device (PC) with a male 9-pin Sub-D connector. The complete cable configuration is available in Appendix C – Interface Ports.

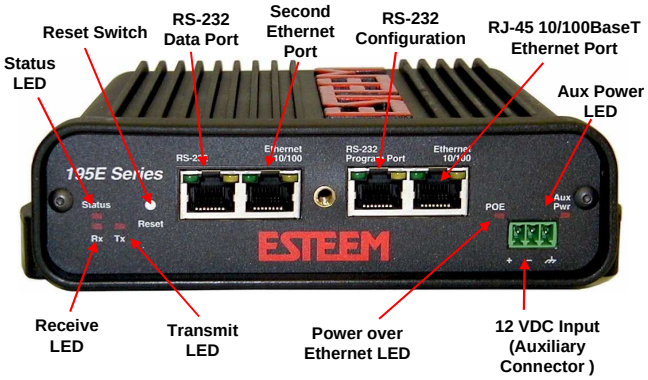


Figure 1: 195Eg Front Panel Overview

Second Ethernet Port

Installation of the serial option also includes installing a second 10/100 Base-T Ethernet interface. This second Ethernet port can be used to Bridge to the first Ethernet port (ETH_0) and the wireless link to work as a two-port HUB when configured in the AP Bridge mode. This second Ethernet port can also be configured as Router port between the wireless and the first Ethernet port in AP Router mode (Figure 2).

AP Bridge Mode

In the AP Bridge mode, both Ethernet ports (ETH_0 and ETH_1) and the wireless port (WLAN_0) are configured for a common subnet and share a common IP address.

AP Router Mode

In the AP Router mode, the two Ethernet ports (ETH_0 and ETH_1) will be on the same subnet. The primary Ethernet port (ETH_0) is bridged to the secondary Ethernet port (ETH_1) and is on a unique subnet than the Wireless port (WLAN_0) configured for Subnet B.

If desired, the secondary Ethernet Port (ETH_1) can be configured for a 3rd subnet (i.e. subnet C). This requires advanced configuration and routing tables specific to the particular networks.

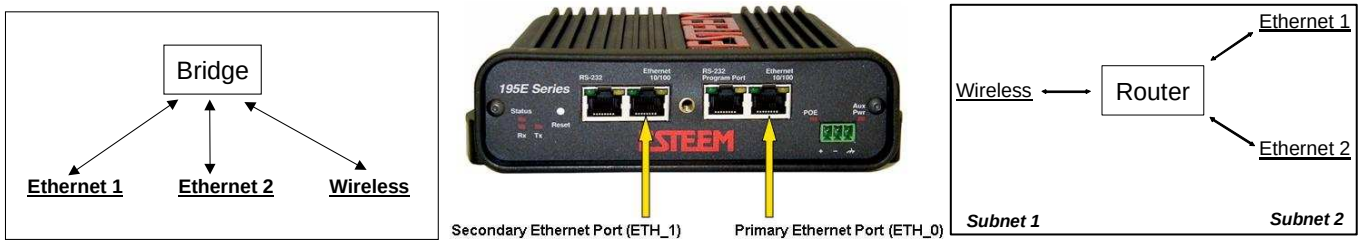


Figure 2: Bridge and Router Configuration for Ethernet Ports

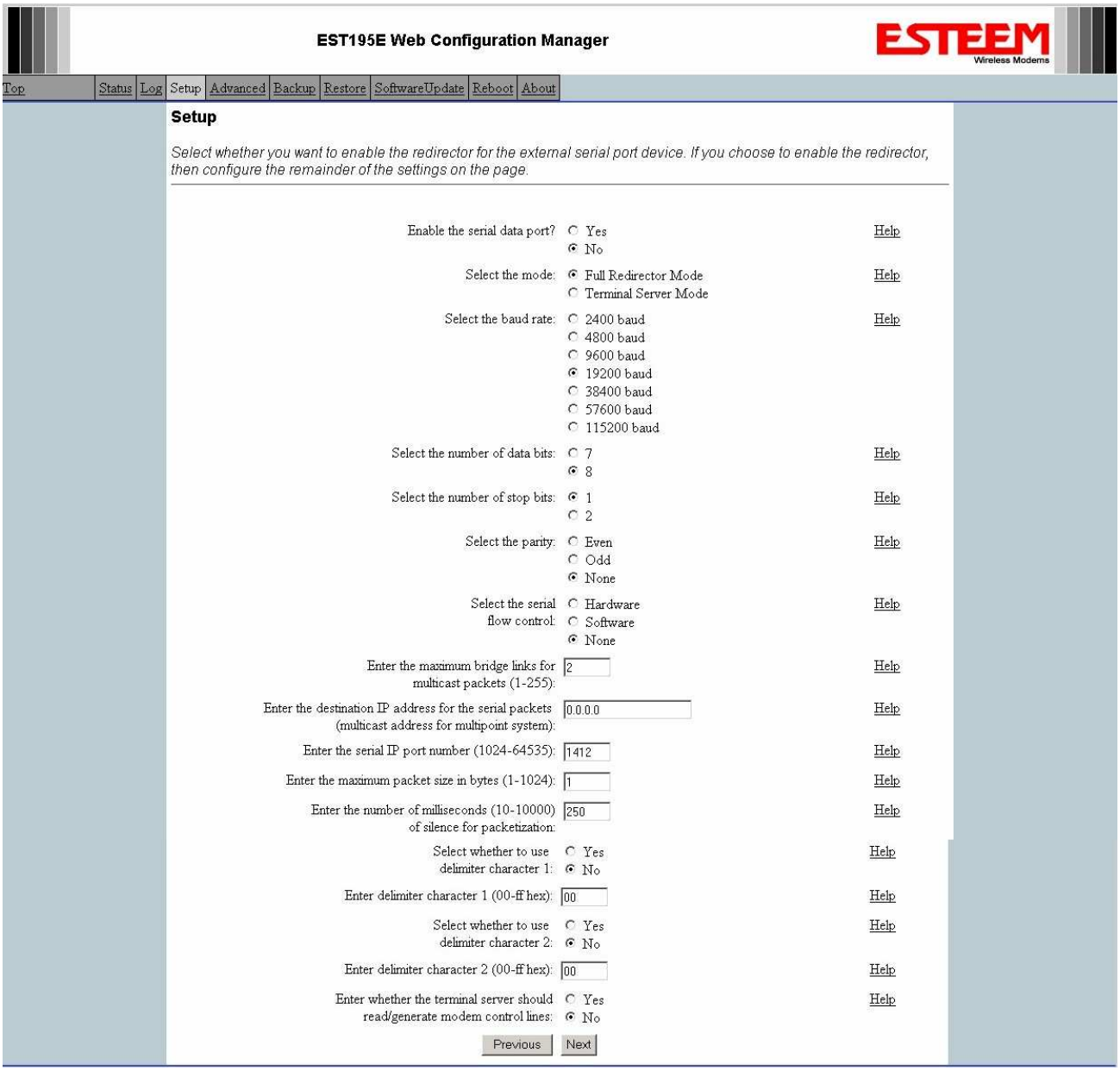

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Select whether you want to enable the redirector for the external serial port device. If you choose to enable the redirector, then configure the remainder of the settings on the page.
Enable the serial data port? Yes No Help
Select the mode: Full Redirector Mode Terminal Server Mode Help
Select the baud rate: 2400 baud 4800 baud 9600 baud 19200 baud 38400 baud 57600 baud 115200 baud Help
Select the number of data bits: 7 8 Help
Select the number of stop bits: 1 2 Help
Select the parity: Even Odd None Help
Select the serial flow control: Hardware Software None Help
Enter the maximum bridge links for multicast packets (1-255): 2 Help
Enter the destination IP address for the serial packets (multicast address for multipoint system): 0.0.0.0 Help
Enter the serial IP port number (1024-64535): 1412 Help
Enter the maximum packet size in bytes (1-1024): 1 Help
Enter the number of milliseconds (10-10000) of silence for packetization: 250 Help
Select whether to use delimiter character 1: Yes No Help
Enter delimiter character 1 (00-ff hex): 00 Help
Select whether to use delimiter character 2: Yes No Help
Enter delimiter character 2 (00-ff hex): 00 Help
Enter whether the terminal server should read/generate modem control lines: Yes No Help
Previous Next

Figure 3: Serial Configuration Screen

SERIAL CONFIGURATION

Configuration of the serial port is completed during the standard setup of the 195Eg. After completion of the Repeater Peer configuration screen, the Serial Port Setup screen (Figure 3) will be displayed. Each section in the Serial Port Setup screen is described in detail with the following:

Enable the RS-232 Data Port

Enabling the serial data port allows the modem to send RS-232 data over the broadband wireless connection established with the ESTeem repeater peers. The modem can be configured in a point-to-point or point-to-multipoint system. Select Yes if you wish to enable the serial data port.

Mode of Operation

There are two distinct modes of operation for the serial port in the 195Eg. The Redirector mode will provide two-way serial communication between two or more serial devices, while the Terminal Server mode will allow serial communication to a specific remote site by connecting through telnet or SSH. Select one of the following modes of operation:

Full Redirector Mode - This mode allows bi-directional RS-232 data communication with another ESTeem. The RS-232 data transmission will appear transparent to the connected devices as if a serial cable is connected between the two ports. This mode will also be used in a multi-point serial network were all serial devices will need bi-directional communication (Figure 4).

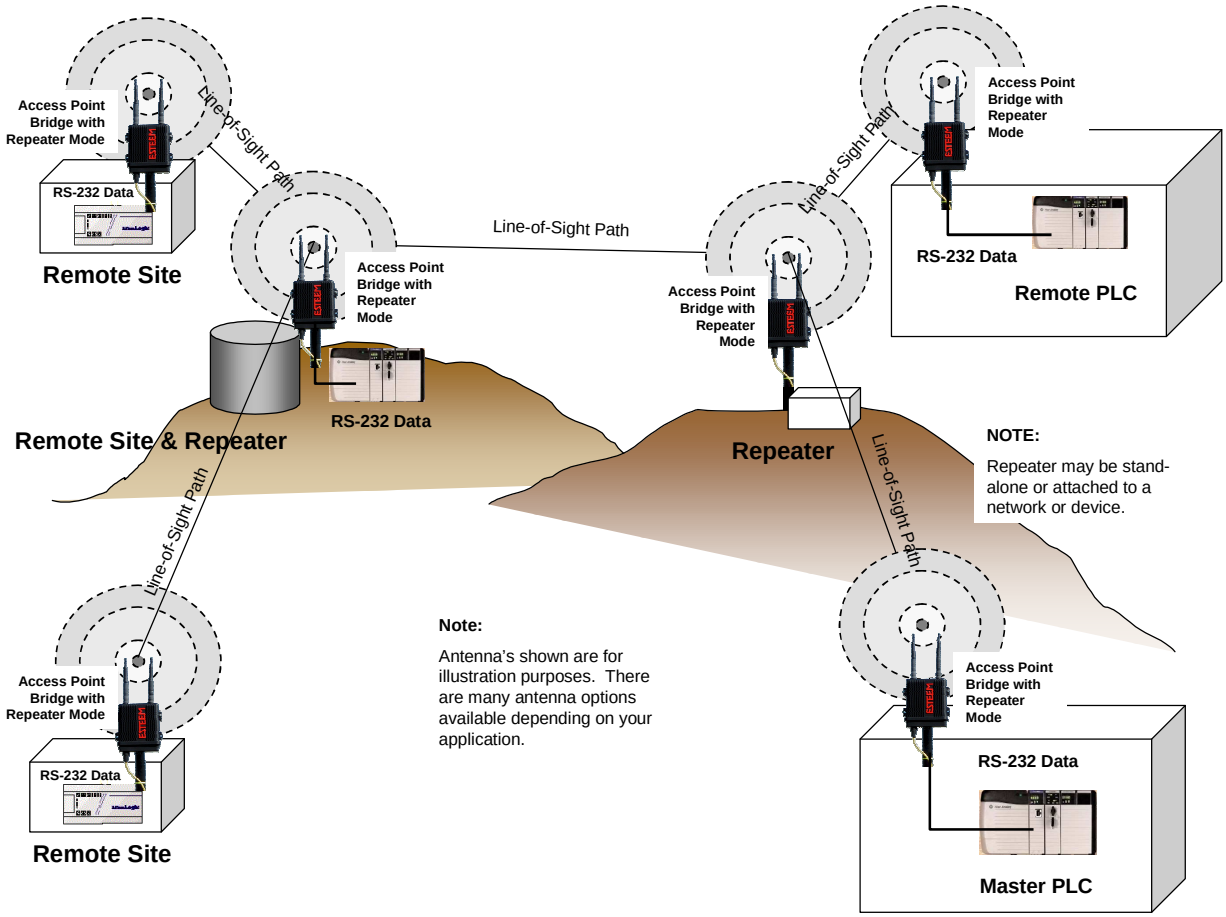


Figure 4: Serial Full Redirector Example

Terminal Server Mode - This mode of operation translates RS-232 serial data into a network-oriented terminal protocol, such as telnet or SSH. This mode would be selected if an interactive RS-232 session at remote locations is desired over the wireless Ethernet link (Figure 5).

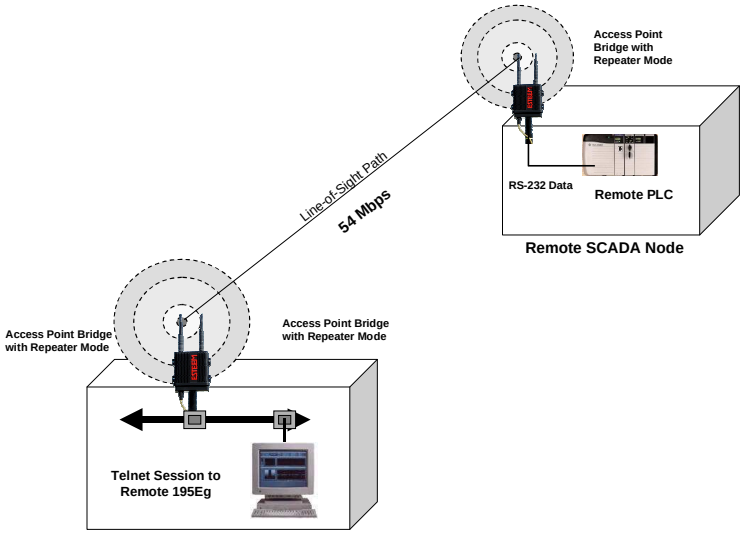


Figure 5: Terminal Server Example

Baud Rate
Select the data rate of the RS-232 connection to match your serial device.

Data Bits
Select the number of data bits on the RS-232 connection to match your serial device.

Stop Bits
Select the number of stop bits on the RS-232 connection to match your serial device.

Parity
Select the parity of the RS-232 connection to match your serial device.

Flow Control
Select the type of data flow control used on the RS-232 connection. The ESTeem can support Hardware flow control (RTS/CTS control lines) or Software Flow Control (XON/XOFF). Select None if no serial flow control is necessary.

Maximum Bridge Links for Multicast Packets
This value sets the maximum number of Ethernet bridge links that the multicast packets will be sent through when used in a multi-point system. A multi-point serial network uses multicast packets (UDP) to send the data to more than one remote ESTeem. You want to limit the number of network bridge links that these UDP packets will be passed through to make the network more efficient.

If you are using multiple ESTeem repeater links to send the serial data to remote locations, the value for the maximum bridge link needs to be increased to a number greater than the longest repeater chain. For example, if you are using four repeater (peer) links to send the serial data between two or more sites the number will need to be five (5) or greater (Figure 4).

Destination IP Address
The ESTeem configured for the correct destination IP and port number will send and receive the serial data from another modem. Set the destination IP address for the ESTeem where the serial data will be sent. If sending to more than one ESTeem (Multipoint) set to a multicast address (i.e 224.0.0.1).

Note: If you are using the ESTeem 195Eg in a multipoint application (multicast), you must have default Gateway configured in the ESTeem set to the IP address of the Root Bridge modem.

Serial IP Port Number
The ESTeem configured for the correct destination IP and port number will send and receive the serial data from another modem. Set the IP port numbers to match where the serial data will be sent. The serial data will not be sent if both the IP address and port number are not correct.

Maximum Packet Size
This number represents the maximum size of the serial data packet in bytes. If the number of bytes of data in the serial port buffer exceeds the maximum packet size before the timer or delimiter character is reached, the ESTeem will send forward the serial packet. For example, if the maximum packet size is set to a value of 100, when the serial port receives 100 bytes the data will be sent through the wireless connection.

Number of Milliseconds for Packetization
This number represents the time the ESTeem will hold data in the serial data buffer before sending to the remote ESTeem. This feature is generally used if the serial data does not have a consistent packet length or delimiter character. For example, if the number of milliseconds is set to a value of 10 the ESTeem will monitor the incoming serial data stream and any break in characters longer than 10 milliseconds will cause the data will be sent through the wireless connection.

Delimiter Characters
Enabling and specifying a delimiter character will transmit the data in the serial buffer when the delimiter character is recognized in the serial data stream. There are two unique delimiter characters that can be configured and enabled independently.

Terminal Server Control Lines
Enabling this feature will allow the ESTeem in the Terminal Server mode to read and generate modem control lines to the connected device.

To increase the wireless network's area of coverage for both indoor and outdoor applications, the ESTeem 195Eg utilizes a custom repeating feature that allows increased coverage areas without the added expense of hard cabling or adding an additional point to point radio link. With a conventional IEEE 802.11g or 802.11b Access Point (AP) network, all of the APs have to be interfaced to a common network either by hardwire, see Figure 1, or a separate, dedicated RF backbone. The Model 195Eg can create this RF backbone, bridge Ethernet networks connected to the wired Ethernet port and provide the wireless canopy for 802.11 clients simultaneously.

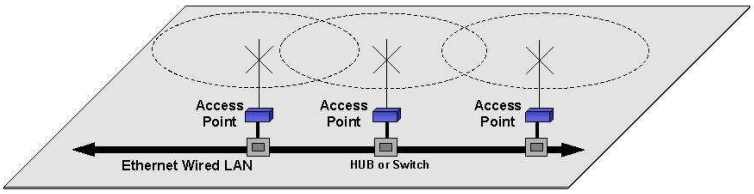


Figure 1: Conventional Access Point Diagram

When programmed in any of the three Access Point (AP) Repeater Modes, the Model 195Eg will create a wireless network with other Model 195Eg units in radio range that are programmed in the AP Repeater Peer table during setup. This feature adds the increased functionality of repeaters to the typical Ethernet Bridge configuration.

ESTEEM MESH NETWORK

One of the most powerful features of the AP Repeater Mode is the ability to input multiple communication routes and designate the priority for each of these routes to create a wireless Mesh network. The ESTeem Model 195Eg will automatically change communication routes in the network if a route has failed. The new route will be based upon the priority level set during configuration. This wireless Meshing technology allows the RF network to "self-heal" if any of the communication paths fail.

The routing priority is manually set during the configuration of the 195Eg. A manual path configuration is far superior to standard "self-discovery" networks, because you have direct control over the best RF paths and can easily identify any failed routes for easy troubleshooting. For example, Figure 2 shows a typical wireless Ethernet system used in the Water/Waste Water Industry. The problem with a standard "self-discovery" Mesh network is the selection of routes. Notice that the communication between the Water Plant (Site A) and Pump Site D has a marginal link, but it is the most direct route between the Ethernet devices.

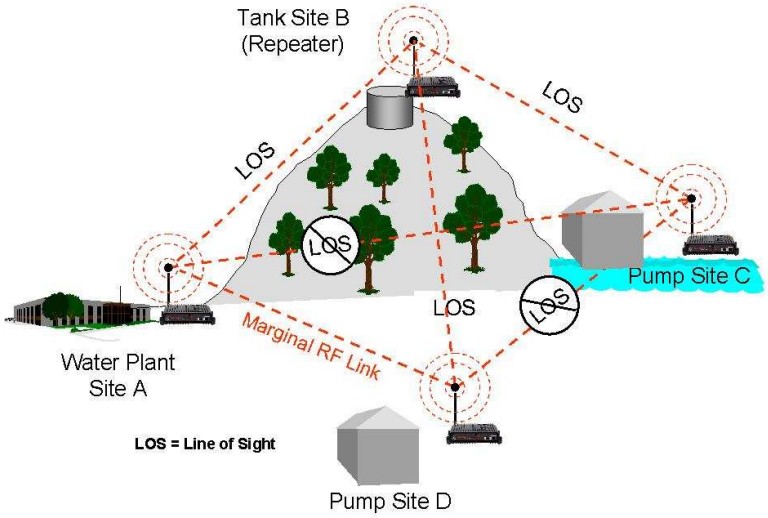


Figure 2: Small Mesh Network Diagram

This scenario poses the question, which path will the network select? The ESTeem Mesh Network takes out the guessing games by allowing the user to select and prioritize all communication routes in the system. In our example we would want the primary link to go through Tank B (Repeater) and use the direct link only if this primary link fails. The following sections will show how this completed.

Configuration

The configuration of the repeater paths is completed during setup of the Access Point modes. All three Access Point modes support repeating and Meshing features. Figure 3 shows an example repeater peer table from the setup menus. For an ESTeem 195Eg to communicate with another ESTeem 195Eg, *Yes* must be selected at the "*Enable Repeater Capability*." Next, the Wireless LAN (WLAN) MAC address of each Model 195Eg that will have direct communications must be added to the Repeater Peer List.

Finally, *enabling the link* allows the corresponding 195Eg to be included in the communication routing. Mobile clients do not require input in the repeater peer table. If multiple Mesh routes are configured, you will also need to set the values for Priority and Path Costs (explained in Spanning Tree below). For multiple examples of repeater configurations, please refer to Chapter 5 of this user's manual.

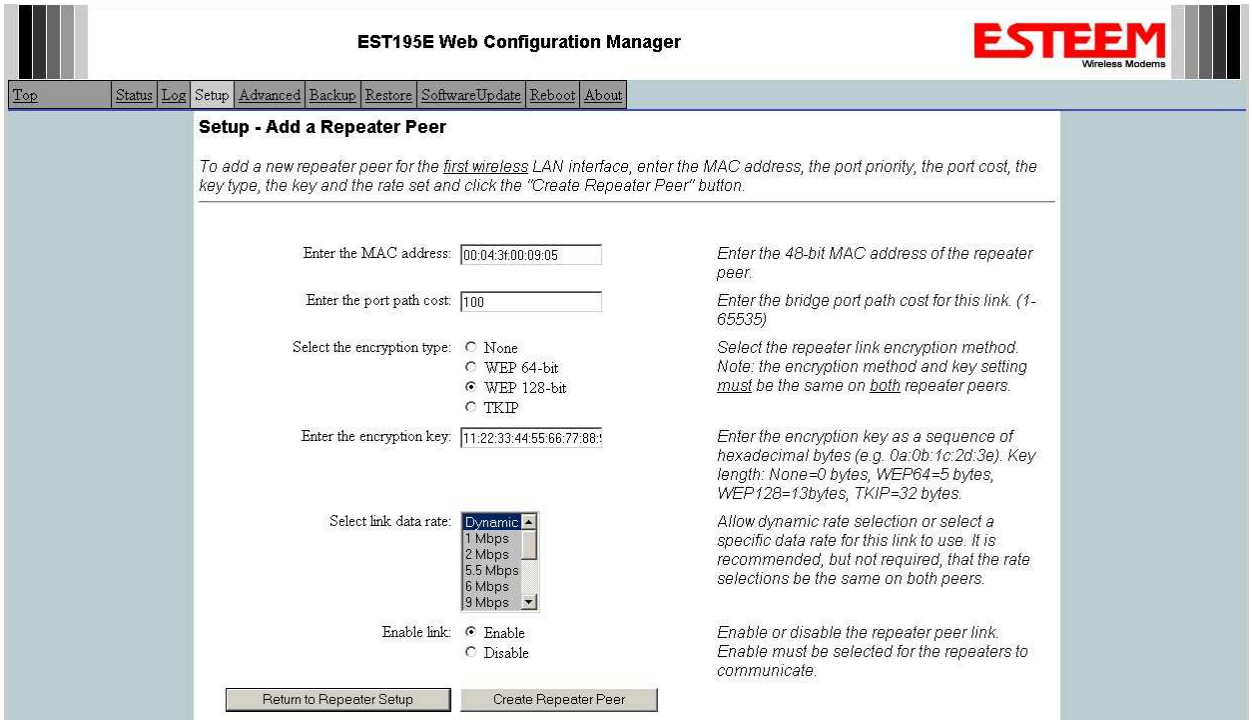

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup - Add a Repeater Peer
To add a new repeater peer for the first wireless LAN interface, enter the MAC address, the port priority, the port cost, the key type, the key and the rate set and click the "Create Repeater Peer" button.
Enter the MAC address:
00:04:3f:00:09:05
Enter the 48-bit MAC address of the repeater peer.
Enter the port path cost:
100
Enter the bridge port path cost for this link. (1-65535)
Select the encryption type:
None
WEP 64-bit
WEP 128-bit
TKIP
Select the repeater link encryption method. Note: the encryption method and key setting must be the same on both repeater peers.
Enter the encryption key:
11:22:33:44:55:66:77:88:
Enter the encryption key as a sequence of hexadecimal bytes (e.g. 0a:0b:1c:2d:3e). Key length: None=0 bytes, WEP64=5 bytes, WEP128=13bytes, TKIP=32 bytes.
Select link data rate:
Dynamic
1 Mbps
2 Mbps
5.5 Mbps
6 Mbps
9 Mbps
Allow dynamic rate selection or select a specific data rate for this link to use. It is recommended, but not required, that the rate selections be the same on both peers.
Enable link:
Enable
Disable
Enable or disable the repeater peer link. Enable must be selected for the repeaters to communicate.
Return to Repeater Setup
Create Repeater Peer

Figure 3: Repeater Configuration Example

RAPID SPANNING TREE PROTOCOL (RSTP)

The ESTeem Model 195Eg, with firmware version 271 and above, uses Rapid Spanning Tree Protocol (RSTP - IEEE 802.1d) to determine the radio routing structure of the wireless network. This RSTP functions the same as standard Spanning Tree Protocol (STP) listed below, but the network recovery is three times faster. If the 195Eg is used in a network that has any older STP only modems, the entire network will be STP.

SPANNING TREE PROTOCOL (STP)

The ESTeem Model 195Eg uses standard Ethernet Spanning Tree Protocol (STP) to determine the radio routing structure of the wireless network. The primary purpose of STP is to make sure that "network loops" are not created. A network loop is having two communication paths to the same destination where the remote device would receive the same data multiple times. If there were no way to control the data flow, this data would be constantly passed around this loop causing a "packet storm" that would shut down the entire network. The Spanning Tree Protocol will block all these redundant links.

The STP operation begins by determining which Ethernet device on the network will be the Root Bridge. All Ethernet networks have a Root Bridge that is selected by the lowest MAC address. All path costs are evaluated against this Root Bridge device to determine routing and which paths will be blocked. On a wired Ethernet network, the location of the Root Bridge is not really important, but in a wireless network selection of the Root Bridge is critical to the wireless network routing. Let's use one of the Example network diagrams from Chapter 5 to continue the discussion (Figure 4).

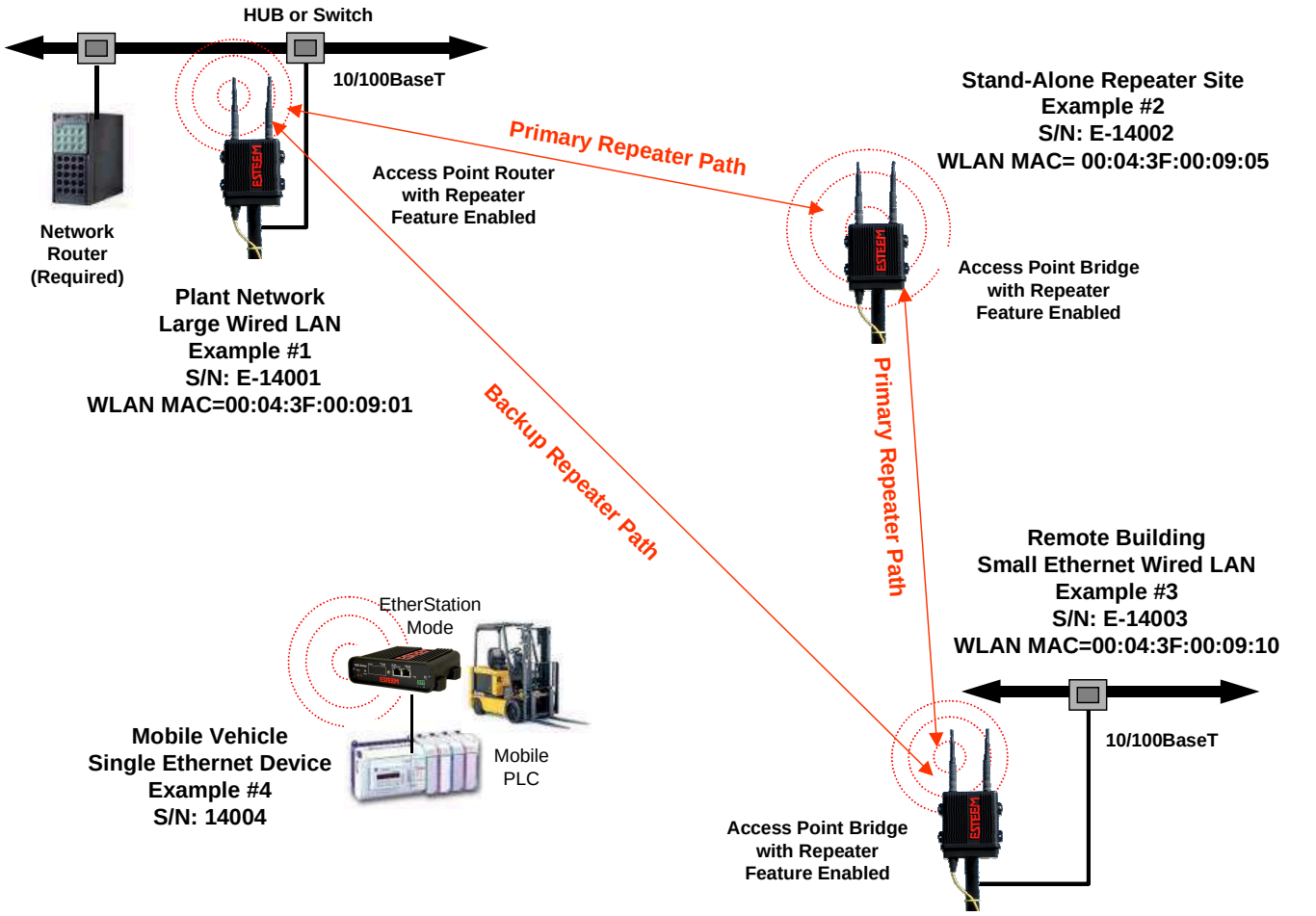


Figure 4: Programming Example #1 Diagram

The following sections describe the process of the STP in the ESTeem Model 195Eg as how it would happen in the above example.

Learning Phase - Once properly configured, each Model 195Eg will begin to search out the other Model 195Eg units in radio range that are programmed in the AP Repeater Peer table. All Model 195Eg's will calculate their routes to every Model 195Eg in the network based upon the lowest "path cost" to the Root Bridge. Path cost is the total cost of transmitting a packet through the wireless network to the Root Bridge. **Note***: The Root Bridge in a network should be the Model 195Eg where the majority of the data flow is processed.* In every wireless network of two or more radios, the Root Bridge should be user defined. If not defined, the ESTeem 195Eg with the lowest MAC address will be designated as the Root Bridge.

In Figure 4, the Plant network (Example 1) is the most logical location for the Root Bridge based upon the amount of data flow. Setting this site as the root bridge is discussed below in Root Bridge.

Blocking and Forwarding Phase – To ensure you do not have a network loop situation due to redundant paths in your wireless network, the Model 195Eg will recognize and disable (block) one or more redundant links and provide back up links should the

primary link fail. This establishes a wireless mesh network with a series of forwarding links, based upon the shortest path cost to the Root Bridge.

For example, looking at Figure 4, the Remote Building has two routes to the Root Bridge (Plant Network – Example #1); directly to the site and through the repeater. The direct link between the two sites is the shortest route (lowest Path Cost) and will be selected as the primary route unless overridden by manually changing the Path Cost in the configuration.

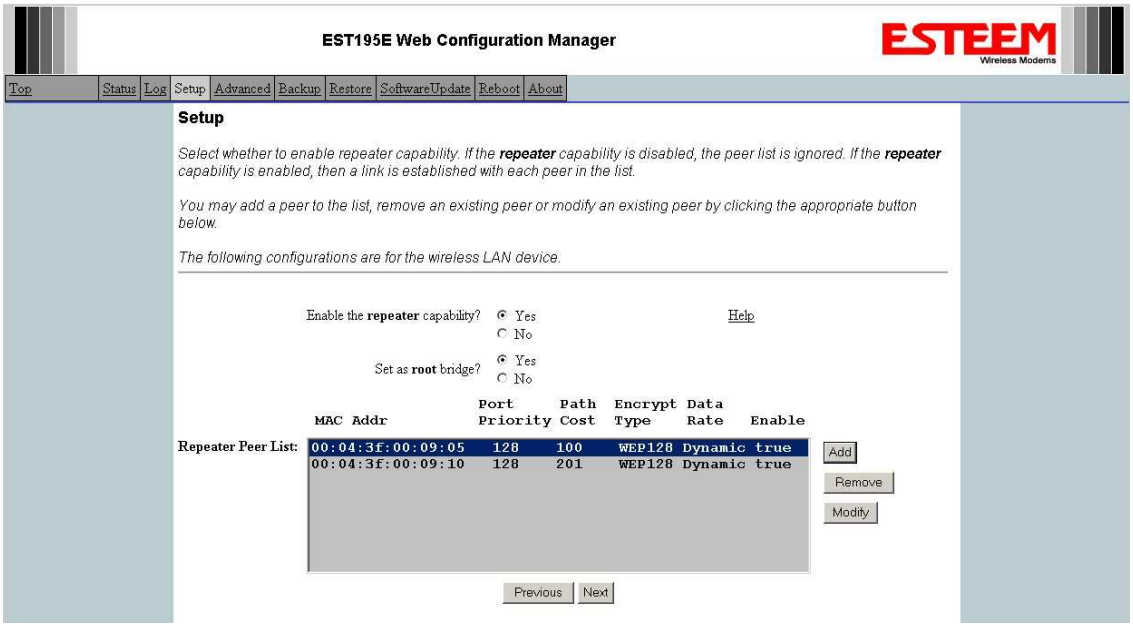


Figure 3: Repeater Configuration Example

Path Cost

If more than one communication path to the Root Bridge is found, the 195Eg must determine which route to take based upon the lowest Path Cost. The default path cost to all links in the 195Eg network is 100. If the Path Costs are equal then the lowest MAC address will determine the priority route. In the ESTeem Mesh Network we want to directly control all data flow so do **not** want the routes to be automatically determined.

Looking again at our Example in Figure 4, if we made no changes to the default path cost of 100 (note values in Figure 3) the lowest path cost would be direct from the Remote Building to the Root Bridge (Plant Network).

Link Description	Number of Routes	Total Path Cost
Direct from Remote Building	1	100
Remote Build to Root Bridge Through Repeater	2	200

To configure the 195Eg to select the repeater as the primary radio path, set the path cost value for the direct link greater than 200 to make this the primary radio path. The lowest path cost will identify the highest priority. The Model 195Eg will use this routing, but also switch to direct communication if the repeater were to disappear.

Root Bridge

In any Access Point Repeater network consisting of more than two sites, one Model 195Eg should be designated as the Root Bridge. Only one Model 195Eg can be designated as the Root Bridge in a given network and should be located where the majority of the Ethernet data flow is processed. This site may be the Master location in a SCADA network or could be configured at a repeater site. Selection is important because all Model 195Eg's NOT configured as the Root Bridge will choose routing based

upon the Path Cost to the Root Bridge. If you have any question as to which site in your AP Repeater application should be the Root Bridge, contact ESTeem Customer Support at 509-735-9092 or e-mail your application to support@esteem.com.

The Root Bridge will be selected in one of two ways: the Root Bridge can be manually set (recommended) during the configuration of the Repeater Peer table (Figure 3) **or** the Root Bridge designation will default to the lowest MAC address of all the Model 195Eg's in the network. The manual Root Bridge configuration is located in the "Advanced Settings" section.

Redundant Backup

The ESTeem Model 195Eg configured in Access Point Repeater mode will automatically function as a redundant backup if two Model 195Eg's are installed at the same location (Figure 7). If two Model 195Eg's are connected to the same HUB or Switch, one of the Model 195Eg's will be **Blocked** when the Spanning Tree Protocol is completed. The network will continue to use this route until any problem with the original Model 195Eg is detected and the second Model 195Eg will begin operation at that site.

Redundant Master Configuration – The configuration in Figure 7 will also provide a redundant backup for the Master Site (Root Bridge). Configure both Model 195Eg's as Root Bridges (see above) giving the primary Root Bridge a value of 1 and the secondary Root Bridge a value of 2.

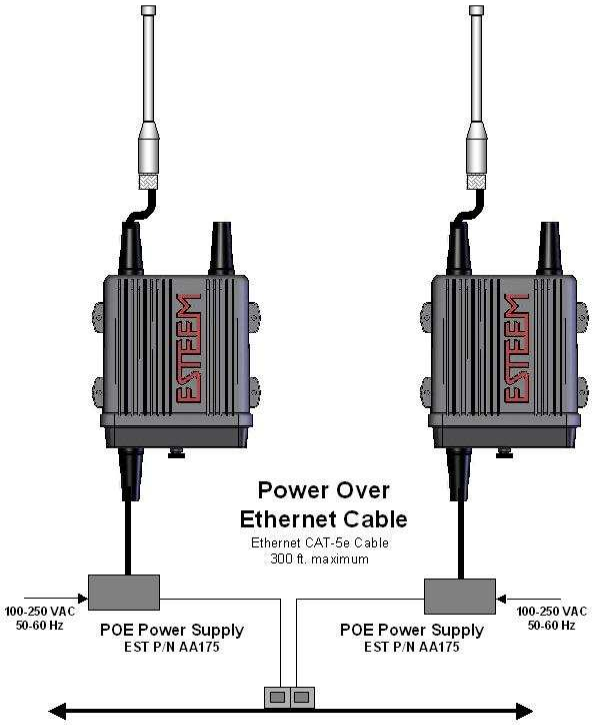


Figure 7: Redundant Backup Diagram

ANTENNA AND CABLE CONFIGURATIONS (POLE MOUNT)

EST offers different types of antennas for both indoor and outdoor configurations. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

Warning: Only the tested cable lengths and antennas provided by EST meet the FCC maximum peak output power requirements. Any other combination of antennas or coax cables is not authorized. This device has been designed to operate in a pole mount configuration with the antennas listed below, and having a maximum gain of 6 dB in a multi-point system or 19dB in a point to point network. Antennas not included in this list or having a gain greater 6 dB in a multi-point system or 19dB in a point to point network are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Part Number: AA01S
- Omni-directional, rubber duck, direct mount, unity gain antenna.
- Indoors and short range outdoor applications.
- There must be a minimum separation distance of 20 cm. from the antenna to the user. ***See Warnings.***

Part Number: AA20DMEg
- Omni-directional direct mount antenna, 5 dBi gain.
- Indoor and outdoor applications.
- There must be a minimum separation distance of 20 cm. from the antenna to the user. ***See Warnings.***

Part Number: AA20Eg
- Omni-directional external pole mount antenna, 6 dBi gain with 3-ft. integral feedline and connector.
- Outdoor applications.
- Antenna port B is not used in this configuration.
- There must be a minimum separation distance of 20 cm. from the antenna to the user. ***See Warnings.***

Part Number: AA203Eg
- Directional pole mount antenna, 6 dBi gain with 3-ft. integral feedline and connector.
- Point to point and point to multi-point outdoor applications.
- Antenna port B is not used in this configuration.
- There must be a minimum separation distance of 20 cm. from the antenna to the user. ***See Warnings.***

Part Number: AA204Eg
- Directional pole mount antenna, 19 dBi gain with 3-ft. integral feedline and connector.
- Point to point applications only.
- Maximum Output Power of 250mWatts (Power Level = Low Power)
- Antenna port B is not used in this configuration.
- There must be a minimum separation distance of 50 cm. from the antenna to the user. ***See Warnings.***

Transmit/Receive Antenna Port **Receive Only Antenna Port**

Notes:

Antenna Port A is a transmit and receive port for use in all applications.

Antenna Port B is a receive only port and is used for dual diversity antennas applications only. This port is not used for point to point applications.

Warnings:

Only pre-made coax cables from the factory used in conjunction with either the AA20Eg omni-directional and AA203Eg or AA204Eg directional antennas meet all FCC Section 15.247(b) EIRP maximum power requirements.

Use of the AA204Eg, directional antenna is limited to fixed point to point applications only. In accordance FCC Section 15.247(b)iii, this antenna must be professionally installed. The installer must ensure the system is used exclusively for fixed, point-to-point applications and the ESTeem Model 195Eg is set for 0.25 Watts output power (Power Level = Min).

ANTENNA AND CABLE CONFIGURATIONS (CABINET MOUNT)

Warning: Only the tested cable lengths and antennas provided by EST meet the FCC maximum peak output power requirements. Any other combination of antennas or coax cables is not authorized. This device has been designed to operate in a cabinet mount configuration with the antennas listed below, and having a maximum gain of 7 dB in a multi-point system or 11dB in a point to point network with the authorized ESTeem coax cables. Antennas not included in this list or having a gain greater 7 dB in a multi-point system or 11dB in a point to point network with any other types or lengths of coax cable are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Part Number: AA20E

- Omni Directional Building Mount Antenna, 6 dBd gain
- Feedline minimums: 25 ft. RG-8 Cable or 50 ft. Heliax Cable with AA228LMR and Lightning Arrestor (EST P/N: AA165).

Part Number: AA203ES

- Directional Building Mount Antenna, 7 dBd gain
- Feedline minimums: 25 ft. RG-8 Cable or 50 ft. Heliax Cable with AA228LMR and Lightning Arrestor (EST P/N: AA165).
- Point to point and point to multi-point applications

Part Number: AA204ES* (Point-to-point ONLY)

- Directional Building Mount Antenna, 11 dBd gain
- Feedline minimums: 25 ft. RG-8 Cable or 50 ft. Heliax Cable with AA228LMR and Lightning Arrestor (EST P/N: AA165).
- ***Point to point applications only.*** ***See Warning.***

Warning:

Only pre-made coax cable systems (Cable, Lightning Arrestor and AA228LMR jumper cable) from the factory used in conjunction with either the AA20E omni-directional and AA203ES or AA204ES directional antennas meet all FCC Section 15.247(b) EIRP maximum power requirements.

Use of the AA204ES, directional antenna is limited to fixed point to point applications only. In accordance FCC Section 15.247(b)iii, the operator or installer is responsible for ensuring the systems is used exclusively for fixed, point-to-point applications.

COAXIAL CABLES

A 25-ft. length of RG-8 coax cable or 50-ft. length of ½"Heliax cable are the minimum cable lengths allowed for use with the above antennas (AA20E, AA203ES, AA204ES) when the Model 195Eg is set at Max Power. Listed below are representative cable losses in db/100 ft at the 2.4 GHz frequency range:

Feedline Type	Attenuation (dB/100 ft.) @ 2.4 GHz	Additional RF Losses	Attenuation (dB)
RG-8 (Solid)	7	AA228LMR (2.5' TNC-MRP/N-MRP) Jumper Cable	0.9
LMR 600	4.4	AA165 Lightning Arrestor	0.1
3/8" Heliax	6.5	All Coax Connector Terminations (2 for every coax cable)	0.2
1/2" Heliax	3.5		
7/8" Heliax	2		
1.25" Heliax	1.6		

In a severe noise environment it may be necessary to use a double shield type of coax cable such as RG-214/U in place of the RG-8. This cable must be purchased from the factory to meet FCC requirements.

Note: *A -3 dB loss means you have lost 1/2 of your signal or transmitter power. A +3 dB gain means you have doubled (x2) your signal or transmitter power.*

Example:

A 6 dB antenna will increase the radiated output power of a 1 watt transmitter to 4 watts {times 4 = 3 dB (x2) + 3 dB (x2)} and increase the received signal strength to receiver times 4.

WEATHER PROOFING COAX CONNECTIONS

1. Coat the threads of the connectors with silicone lubricant prior to assembly (See Note 1) and hand tighten. Care should be taken not to get any lubricant on the center conductor.

2. Wrap the connector assembly with a vapor barrier patch for weather proofing (See Note 2), ensuring to overlap onto the coax cable approximately 1 1/2 inches.

3. Apply an electrical coating (sealing agent) over the vapor barrier patch for added protection (See Note 3).

Notes:

1. *Dow Corning RTV-3140 or equivalent.*

2. *Suggested vendors:*
   VAPOR-WRAP
   Decibel Products
   3184 Quebec St.
   Dallas, TX 75356
   214-631-0310

   VYNIL-MASTIC, P/N 2200
   3-M Company
   Customer Service
   512-984-1800

3. *SCOTCHKOTE, 3-M Company, or equivalent.*

ANTENNA DIVERSITY

The dual diversity antenna configuration on the ESTeem Model 195Eg allows the radio to operate more efficiently in areas with high reflections (such as indoors or in a city) and without direct line of sight (LOS) between the antennas. One of the most difficult conditions to control in a radio system is the effect of a destructive reflected radio signal called mutipathing. Multipathing occurs when waves emitted by the transmitter travel along a different path and interfere destructively with waves traveling on a direct line-of-site path. The phenomenon occurs because waves traveling along different paths may be completely out of phase when they reach the antenna, thereby canceling each other out. The dual diversity antenna configuration places a physical distance between the antennas where one reflected signal will be out of phase, but the second will be not. The ESTeem Model 195Eg will sample both antennas and select the best receive signal.

ANTENNA PORT SELECTION

The antenna ports on the Model 195Eg must be configured for either a single receive antenna (external mount antennas) or dual diversity antenna setup. To access the port configuration open ESTeem Web page using your computer's Web Browser as per instructions in Chapter 4. Select Advanced from the menu items and Radio Settings-wlan0 device (Figure 1).

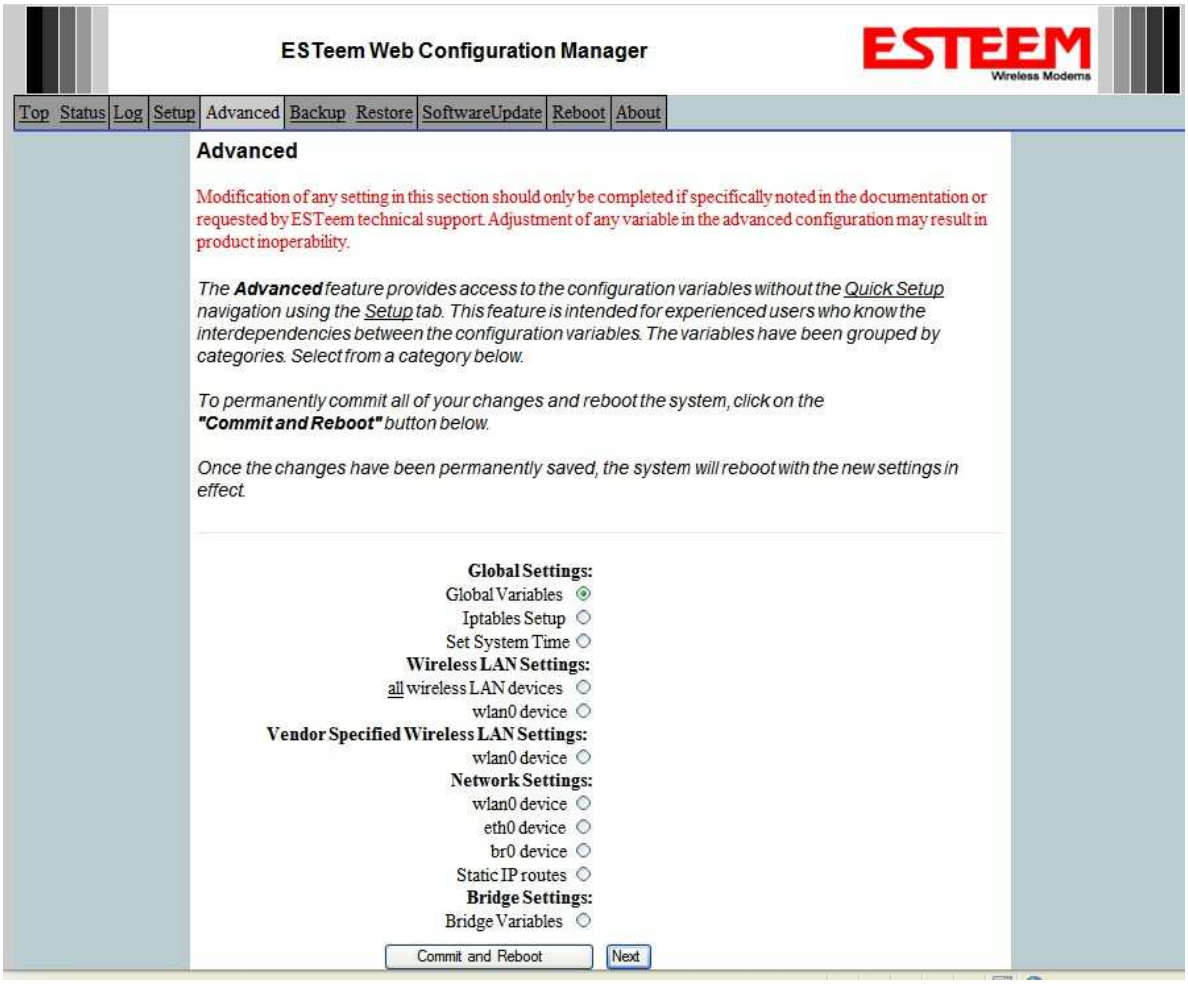

ESTeem Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 1: Advanced Settings Menu

Press the next button and Figure 2 will be displayed. The receive antenna is configured by selecting the wlan0_dot11CurrentRXAntenna drop down (Figure 2) and selecting the receive antenna. A value of 0 = Dual diversity (Both antenna Ports A & B will be used to receive). A value of 1 = Single receive source (Antenna Port A only).

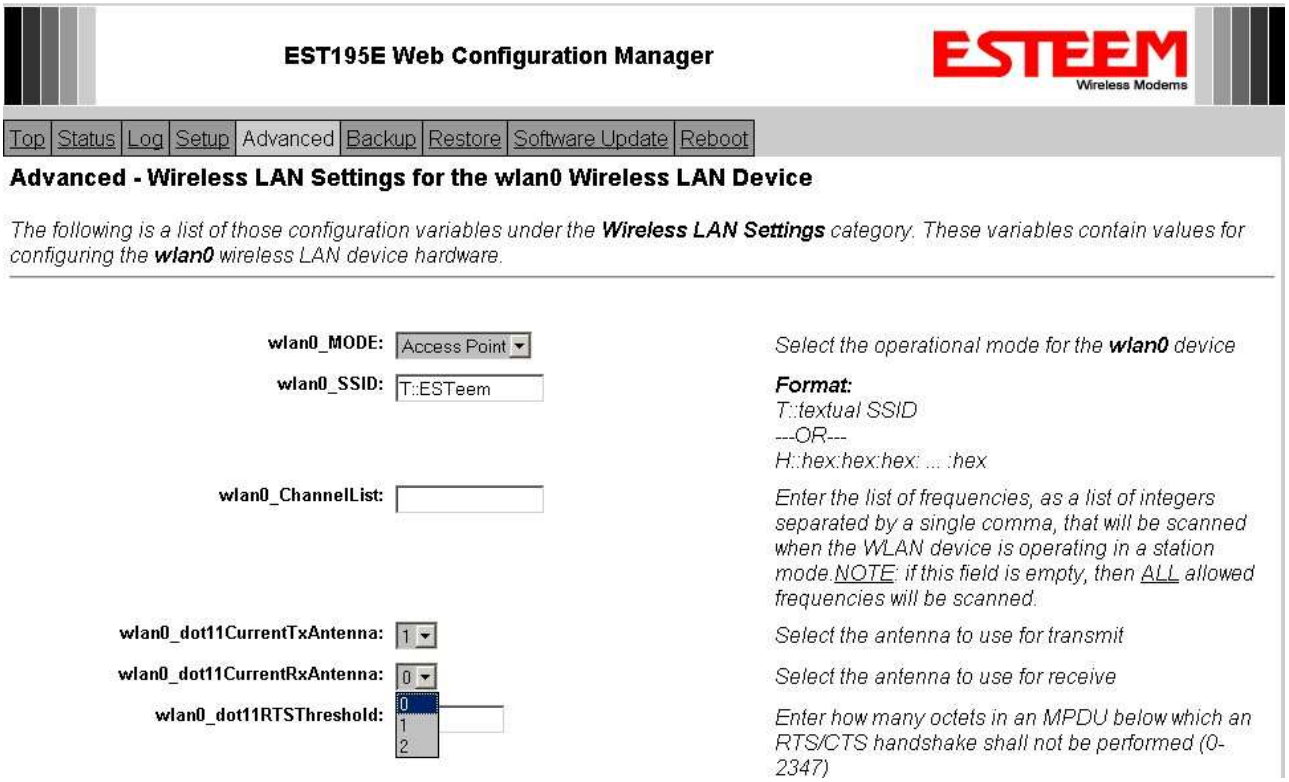

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
Software Update
Reboot
Advanced - Wireless LAN Settings for the wlan0 Wireless LAN Device
The following is a list of those configuration variables under the Wireless LAN Settings category. These variables contain values for configuring the wlan0 wireless LAN device hardware.
wlan0_MODE:
Access Point
Select the operational mode for the wlan0 device
wlan0_SSID:
T::ESTeem
Format:
T::textual SSID
---OR---
H::hex:hex:hex: ... :hex
wlan0_ChannelList:
Enter the list of frequencies, as a list of integers separated by a single comma, that will be scanned when the WLAN device is operating in a station mode.NOTE: if this field is empty, then ALL allowed frequencies will be scanned.
wlan0_dot11CurrentTxAntenna:
1
Select the antenna to use for transmit
wlan0_dot11CurrentRxAntenna:
0
Select the antenna to use for receive
wlan0_dot11RTSThreshold:
0
1
2
Enter how many octets in an MPDU below which an RTS/CTS handshake shall not be performed (0-2347)

Figure 2: Receive Antenna Settings Menu

ASSEMBLING THE AA195PM TWO HOLE OUTDOOR POLE MOUNTING KIT

The AA195PM mounting kit contains everything required for pole mounting and weatherproofing the ESTeem Model 195Eg for outdoor installations. The 195Eg with AA195PM mounting kit can be directly mounted to a round pole from 1.25" to a diameter of 2.25" OD. Any mounting structure greater than 2" requires hose clamp strapping run through the Pole Mount Brackets. The mounting kit requires the following assembly:

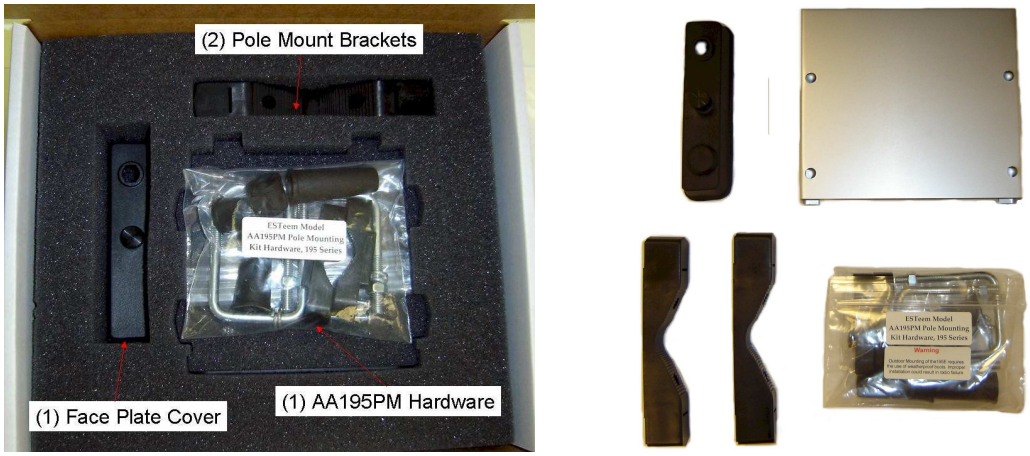


Figure 1: Packet Box Contents

1. If you purchased an AA195PM mounting kit with your Model 195Eg, the kit will be packed in the same packing box as the ESTeem (Figure 1).

2. Remove and inventory the two (2) Pole Mounting Brackets, one (1) Two-Hole Face Plate Cover (with single port cover installed), one (1) Heat Shield and (1) AA195PM Hardware bag from the packing box (Figure 1). Report any missing or damaged items to ESTeem Customer Support (509-735-9092 Phone) as soon as possible for replacement.

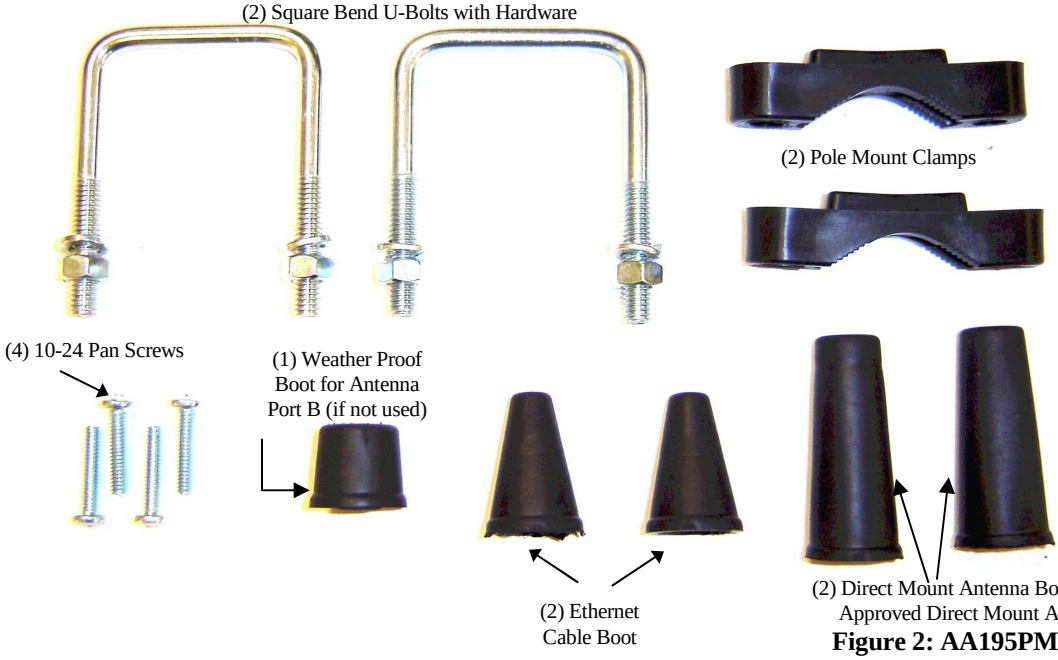

(2) Square Bend U-Bolts with Hardware
(2) Pole Mount Clamps
(4) 10-24 Pan Screws
(1) Weather Proof Boot for Antenna Port B (if not used)
(2) Ethernet Cable Boot
(2) Direct Mount Antenna Boots for ESTeem Approved Direct Mount Antenna Only

Figure 2: AA195PM Hardware Contents

3. Inventory the AA195PM Hardware bag for all the components listed in Figure 2.

4. Assemble the two Pole Mounting Brackets with the included U-bolts, hardware and Pole Mount Clamps. Reference Figure 3.

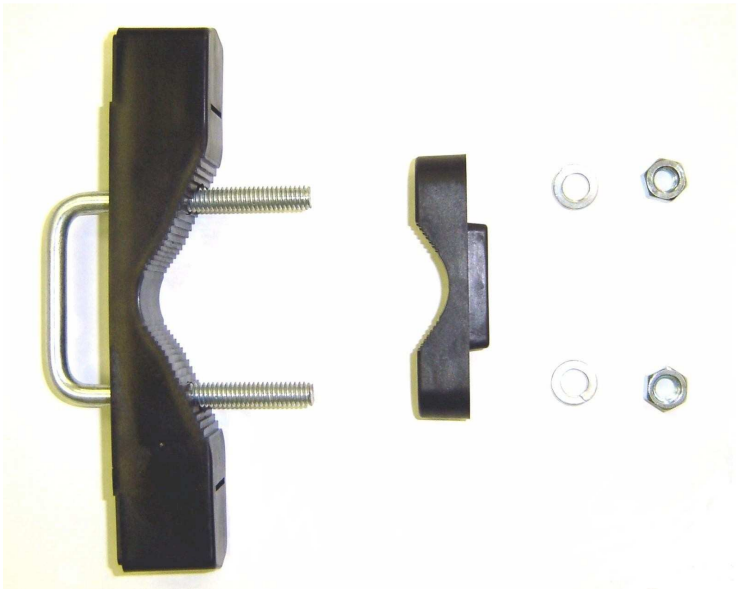


Figure 3: Pole Mount Assembly

5. Place the four supplied 10-24 x 1" Phillips Pan Head screws through the mounting holes of the Heat Shield and attach to the to the top of the ESTeem 195Eg (Figure 4).

Figure 4: Heat Shield Attachment

6. Attach the two Pole Mounting Brackets to the ESTeem Model 195Eg with the 10-24 x 1" Phillips Pan Head screws through

Figure 5: Pole Mount Connection to Case
(Heat Shield Removed for Detail)

the top of the heat shield. Reference Figure 5 (Heat Shield removed for detail).

7. Assemble the outdoor rated CAT-5e Ethernet cable (Not Provided) with the supplied Ethernet Cable Boot (Figure 6).

Figure 6: Ethernet Cable Assembly

8. Feed the CAT-5e Ethernet connector(s) through the Face Plate Cover and secure the Ethernet Cable Boot to the cover. Reference Figure 7. *NOTE: The Ethernet cable boot must be installed before the RJ-45 end is installed. If using the ESTeem AA09.1 outdoor Ethernet cable, verify that the Ethernet cable boot end is routed toward the ESTeem 195Eg.*

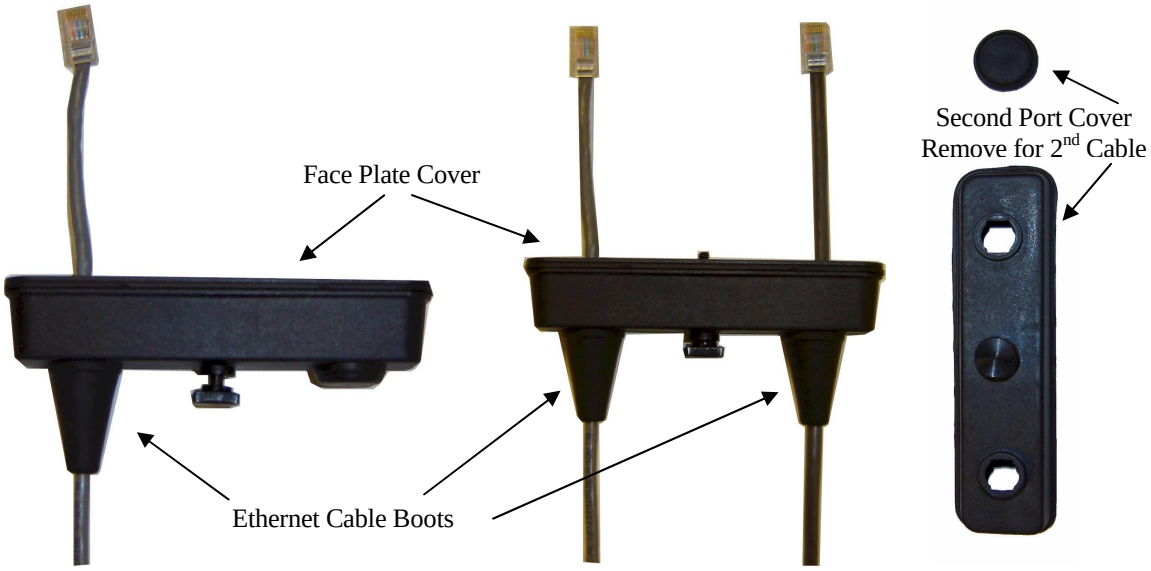


Figure 7: Ethernet Cable Routing

9. Route the CAT-5e Ethernet cable through the molded strain-relief fins in the Face Plate Cover (Figure 8) to secure the cable and provide strain-relief for the connector. If a second Ethernet cable is installed, remove the second port cover and route cable.

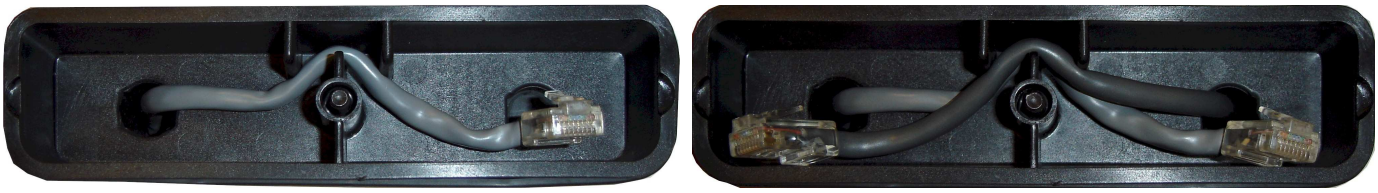


Figure 8: Face Plate Cover Strain Relief

10. Plug the CAT-5e Ethernet cable to the Model 195Eg's Ethernet port and secure the Face Plate Cover with the attached thumb screw. Verify that the weatherproof seal on the Face Plate Cover is sealed against the outer rim of the Model 195Eg. Reference Figure 9.

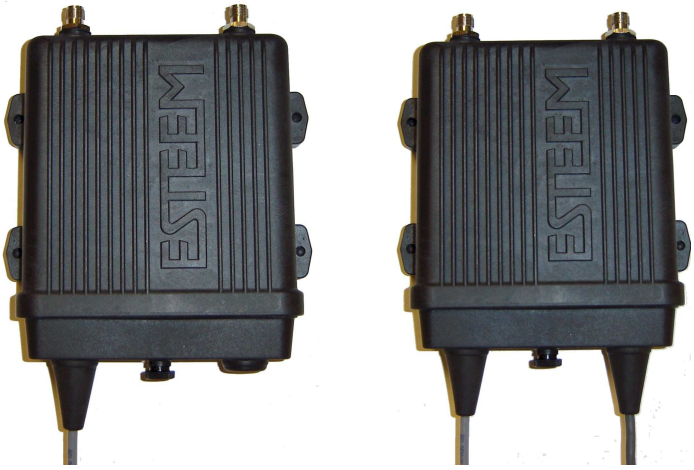


Figure 9: Face Plate Cover Installed on ESTeem

11. Attach the antenna connector boots as show in Figure 10 for either dual attached antennas or external antennas. You are now ready to mount the ESTeem Model 195Eg

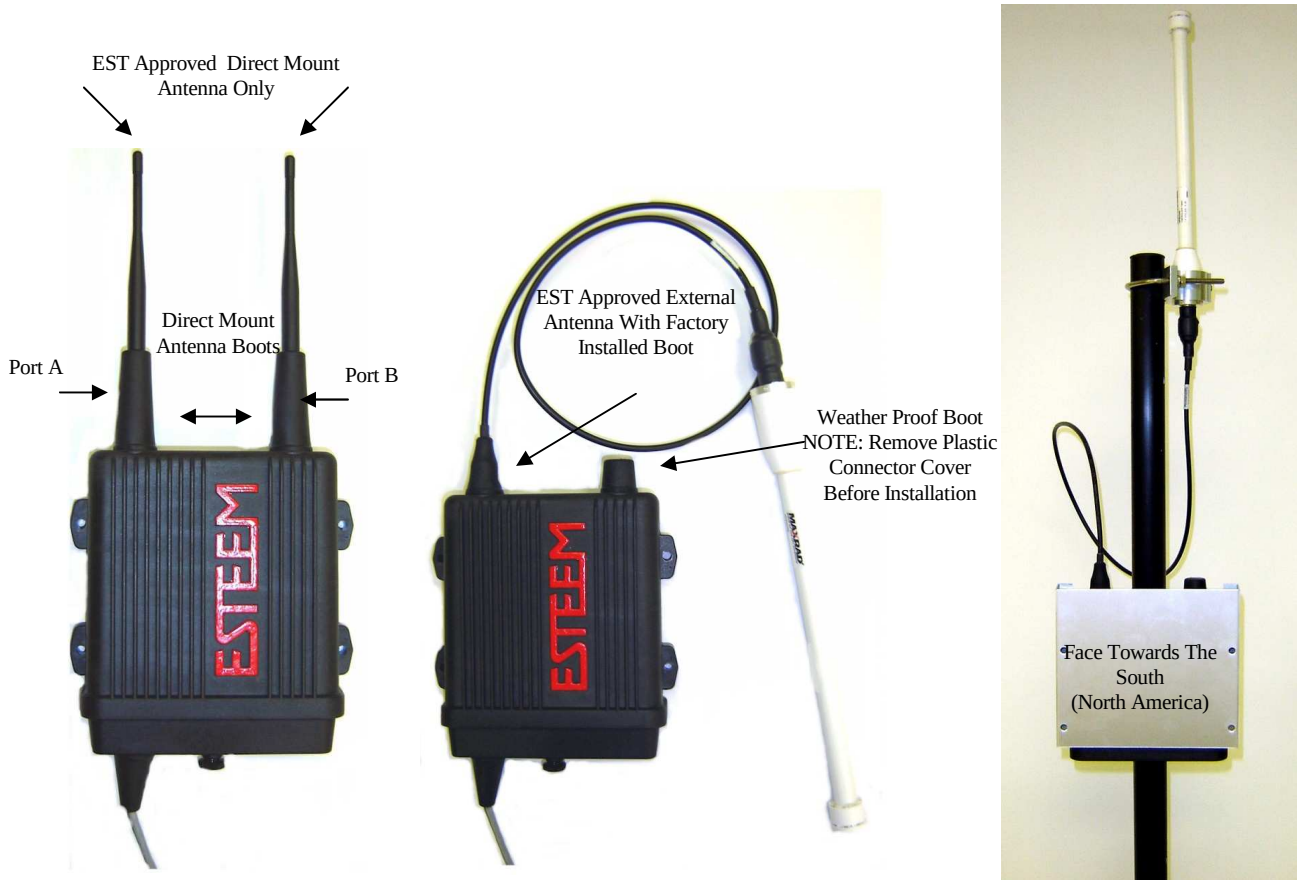


Figure 10: Completed AA195PM Mounts

Caution: Outdoor mounting of the 195E requires the use of weatherproof boots. Improper installation could result in radio failure.

Caution: Always mount the 195Eg vertically with the antenna ports on top.

195E POLE MOUNT GROUNDING PROCEEDURES

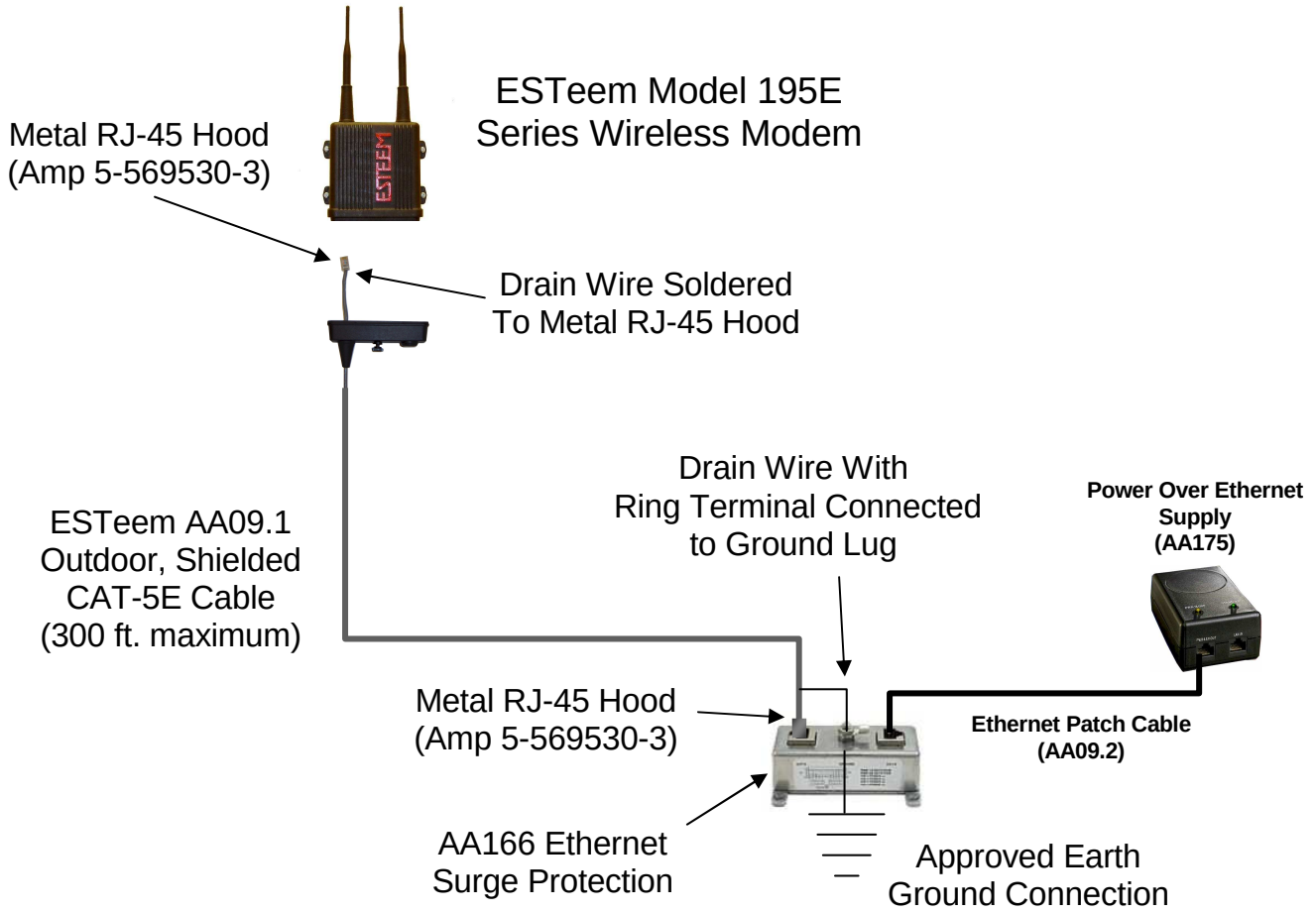
Mounting the 195E series radio modem outdoors requires proper grounding procedures to prevent damage to both the radio hardware and the connected Ethernet and Serial peripherals. The case on the 195E series wireless modem is electrically conductive, but the AA195 Pole Mount kit provides isolation from the connected structure. To bring the 195E case to a ground potential with Earth ground and eliminate any static buildup on the case itself, the shield on the Ethernet cable is used to provide the ground connection.

Outdoor Ethernet Cable

A critical component of this grounding protection system is the ESTeem AA09.1 outdoor, shielded CAT-5E Ethernet cable. This cable provides three, necessary elements; Ethernet data, DC Power over Ethernet (PoE) applications, and a ground from the 195E case to the AA166 surge protector. The Ethernet cable is outdoor rated and protected from UV breakdown.

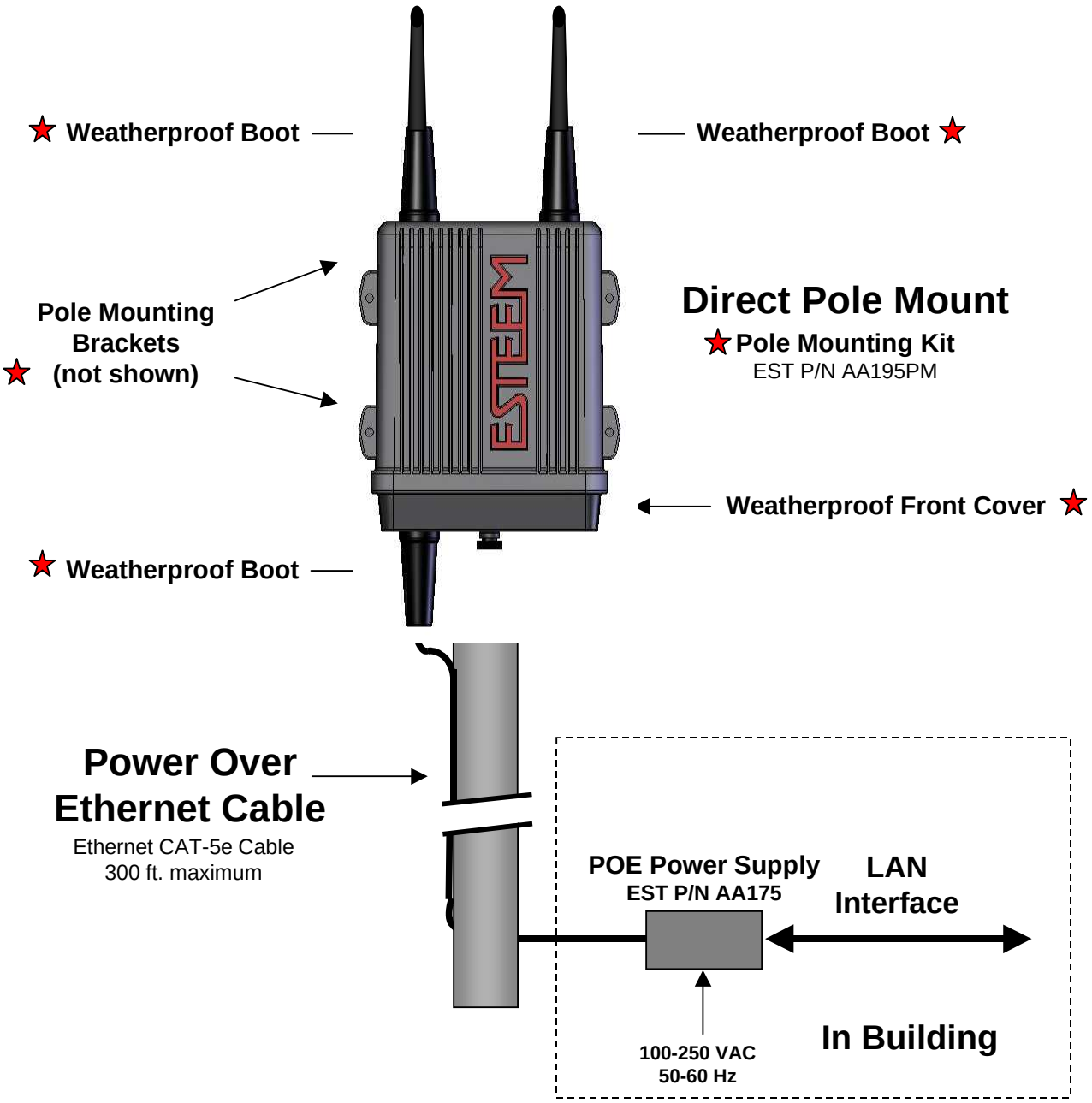
Installation

The following diagram outlines all the critical components and connections in the 195E series system. The Earth ground connection to the surge protector must be installed to comply with local Electrical code requirements.



Model 195E Series with Direct Mount Dual Diversity Antennas

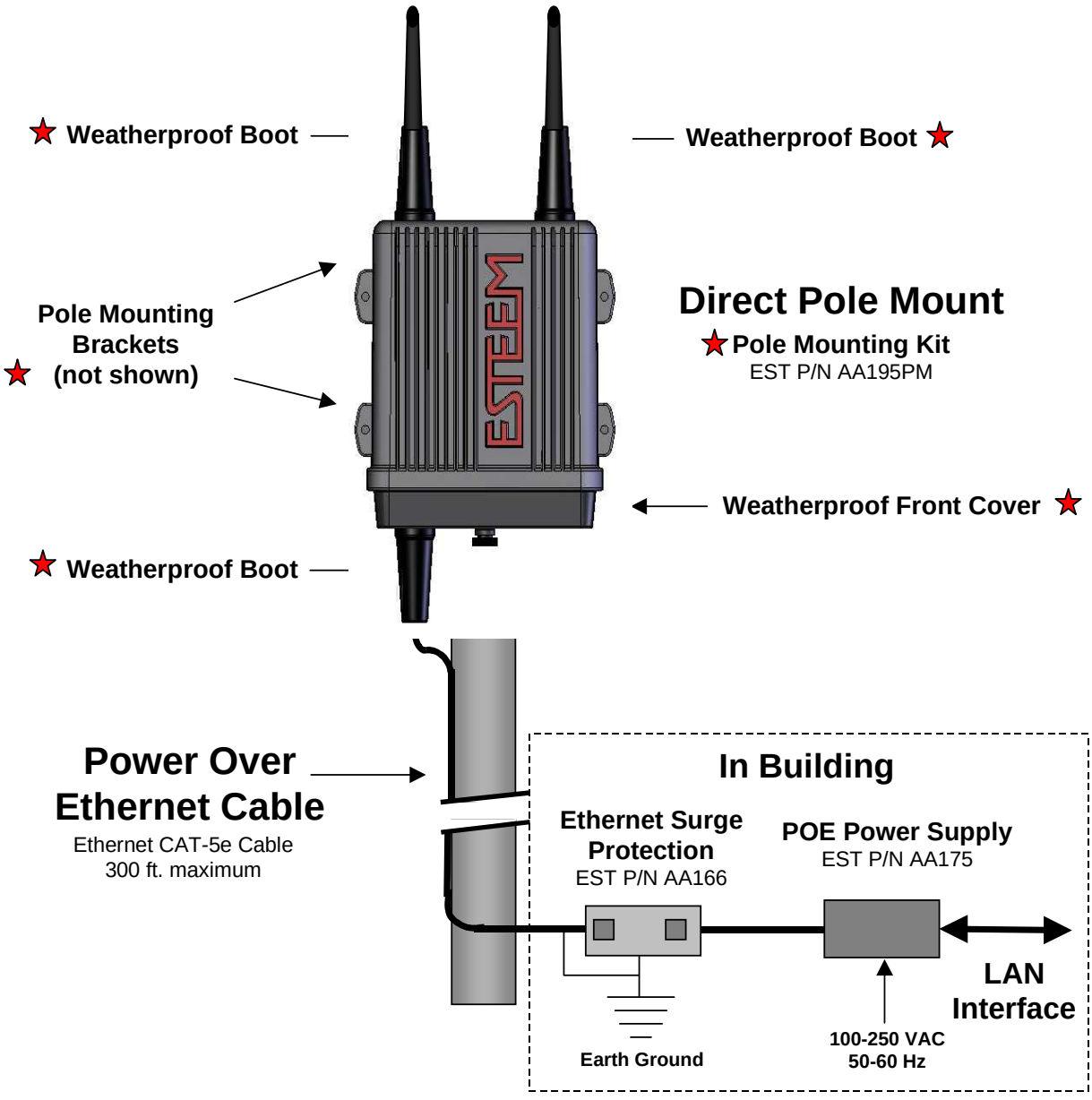
Case Mount Omni-Directional
Dual Diversity Antennas
EST P/N AA01S or AA20DMEg



Caution: Always mount the 195Eg vertically with the antenna ports on top.

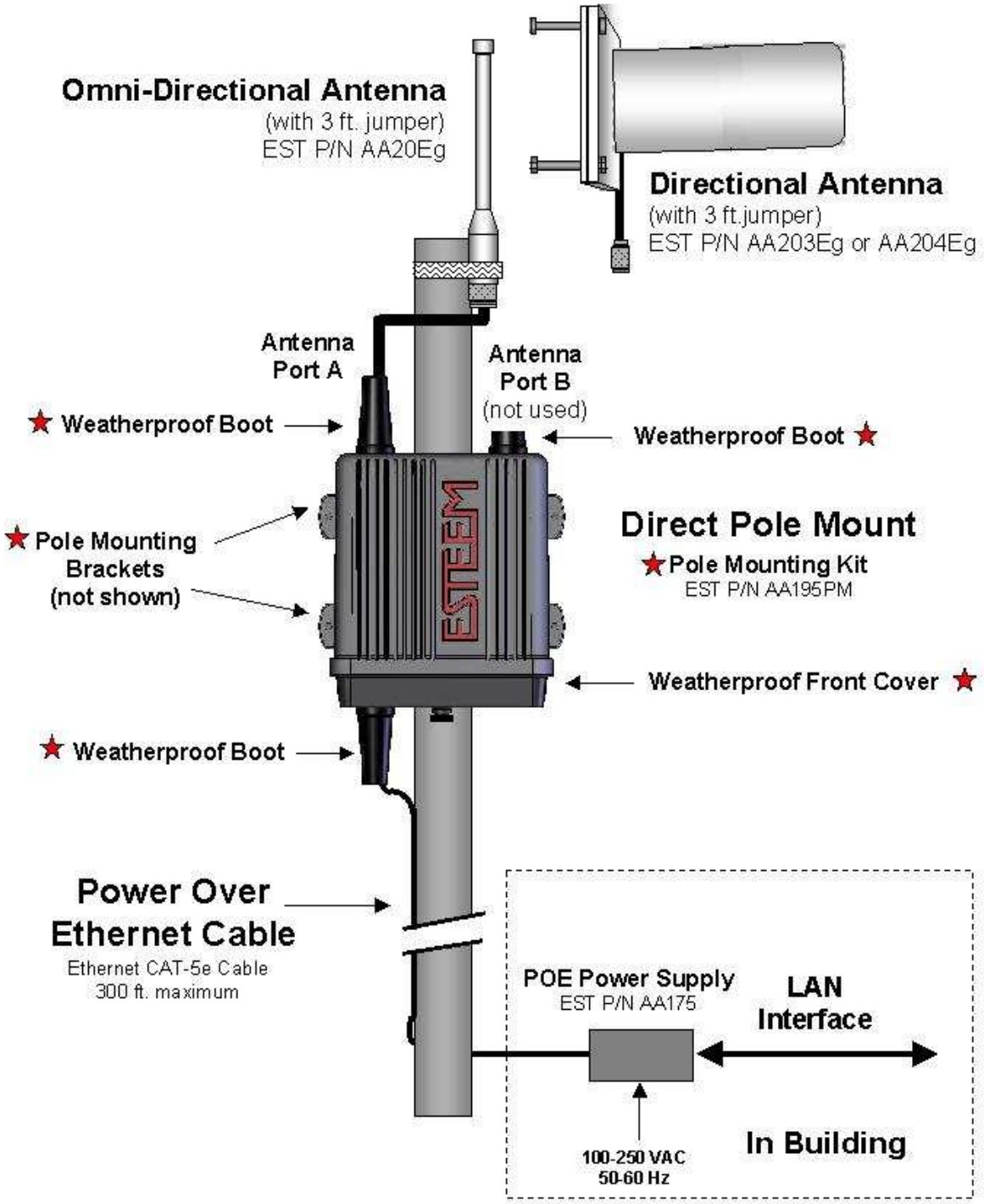
Model 195E Series with Direct Mount Dual Diversity Antennas and Surge Protection

Case Mount Omni-Directional
Dual Diversity Antennas
EST P/N AA01S or AA20DMEg



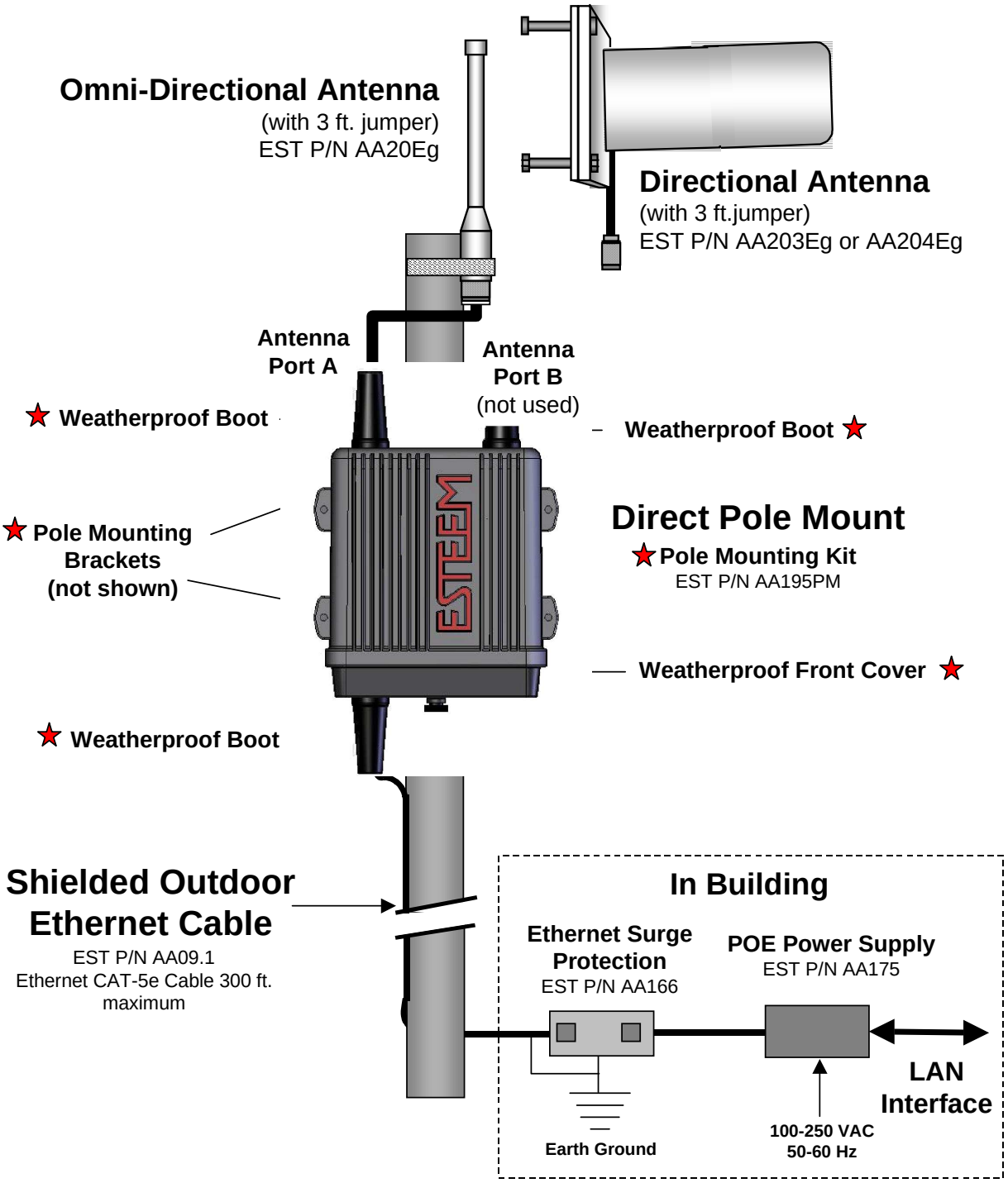
Caution: Always mount the 195Eg vertically with the antenna ports on top.

Model195E Series with External Mount Antennas



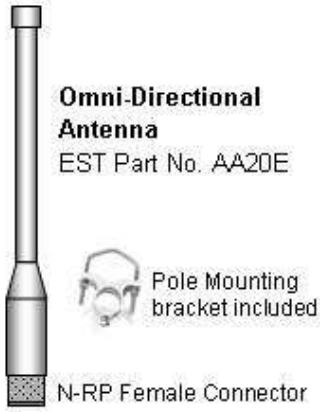
Caution: Always mount the 195Eg vertically with the antenna ports on top.

Model195E Series with External Mount Antennas and Surge Protection



Caution: Always mount the 195Eg vertically with the antenna ports on top.

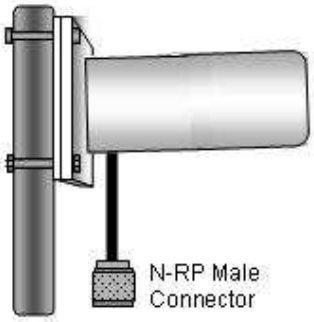
Model 195Eg
Cabinet Mount Hardware Diagram



Omni-Directional Antenna
EST Part No. AA20E

Pole Mounting bracket included

N-RP Female Connector



N-RP Male Connector

Directional Antennas

For Point to Point Applications use EST Part No. AA204ES

For Point to Multi-point Application use EST Part No. AA203ES

Pole mounting brackets included.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 19 cm must be maintained between the antenna and all persons.

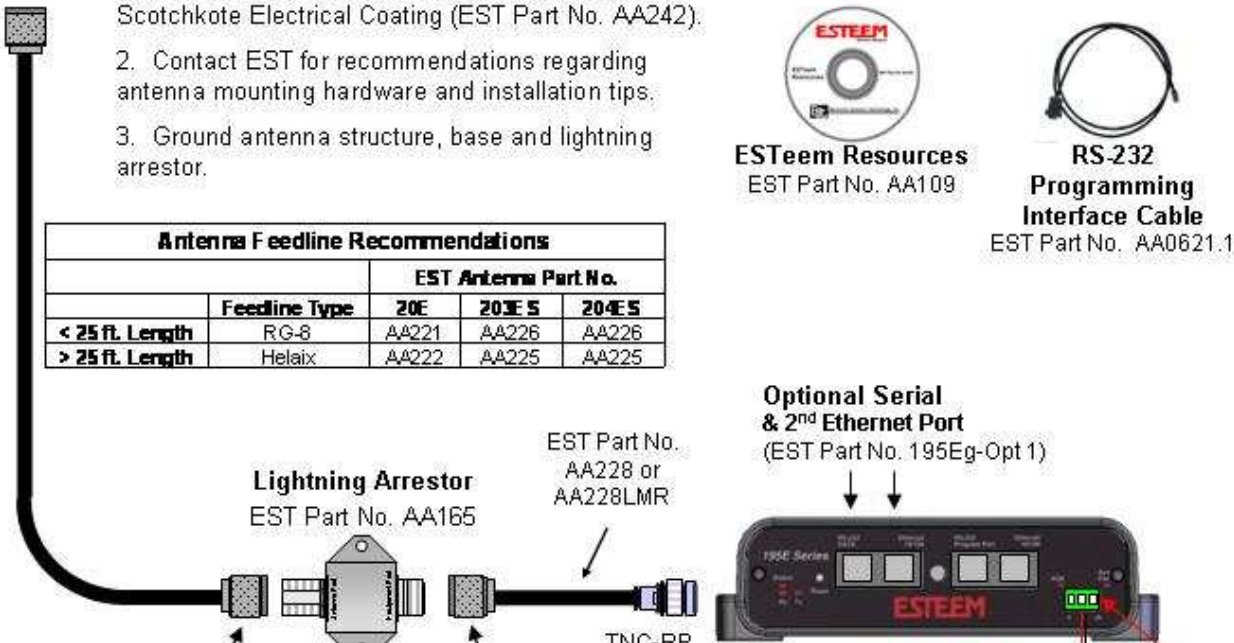
NOTES

1. Vapor wrap all external antenna coax connections with vinyl wrap (EST Part No. AA241) and apply Scotchkote Electrical Coating (EST Part No. AA242).
2. Contact EST for recommendations regarding antenna mounting hardware and installation tips.
3. Ground antenna structure, base and lightning arrestor.

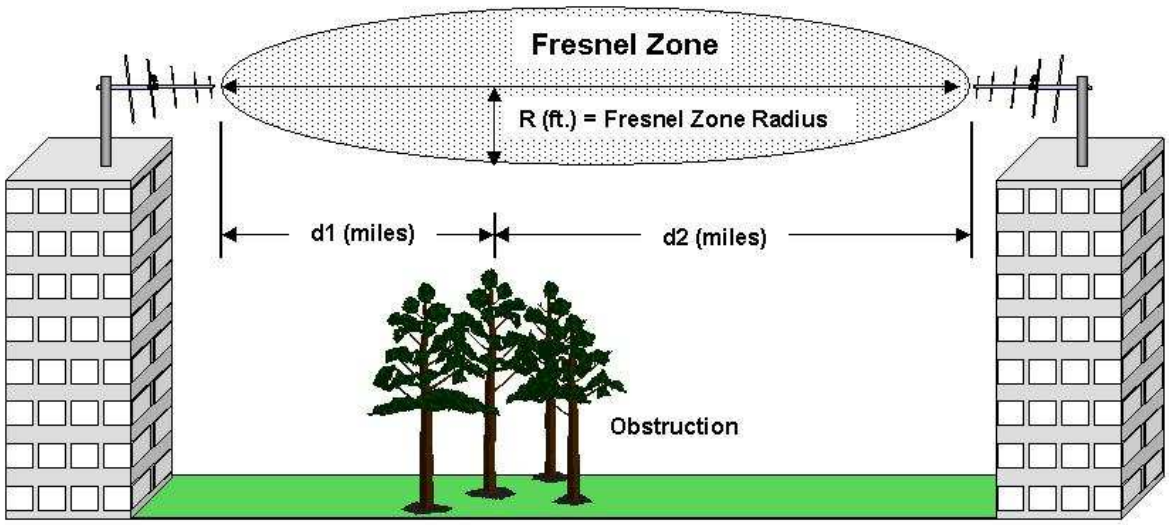
ESTeem Resources
EST Part No. AA109

RS-232 Programming Interface Cable
EST Part No. AA0621.1

Antenna Feedline Recommendations				
		EST Antenna Part No.		
	Feedline Type	20E	203ES	204ES
< 25 ft. Length	RG-8	AA221	AA226	AA226
> 25 ft. Length	Helaix	AA222	AA225	AA225



FRESNEL ZONE



The Fresnel zone shows the ellipsoid spread of the radio waves around the visual line-of-sight after they leave the antenna (see figure above). This area must be clear of obstructions or the signal strength will be reduced due to signal blockage. Typically, 20% Fresnel Zone blockage introduces little signal loss to the link. Beyond 40% blockage, signal loss will become significant. This calculation is based on a *flat earth.* It does not take into account the curvature of the earth. It is recommended for RF path links greater than 7 miles to have a microwave path analysis done that takes the curvature of the earth and the topography of the terrain into account.

Fresnel Zone Radius = 72.1 SQRT [(d1d2) / (F(d1 + d2)]

Units
Fresnel Zone Radius in feet.
d1 and d2 in statue miles
F in GHz

APPENDIX A
FCC INFORMATION

INFORMATION TO USERS

The ESTeem Model 195Eg complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note to User:

Changes or modifications to this equipment not expressly approved by Electronic Systems Technology for compliance could void the user's authority to operate the equipment.

Other Information

Model 195Eg

Direct Sequence Spread Spectrum Device

FCC Type Acceptance No: ENPESTEEM195EG-1

Canadian Certification Number: 1457A-195EG

The equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FEDERAL COMMUNICATIONS COMMISSION FIELD OFFICES

ALASKA
1011 E. Tudor Rd.
Rm 240 Box 2955
Anchorage, AK 99510

CALIFORNIA
Interstate Office Park
4542 Ruffner St., Room 370
San Diego, CA 92111-2216

Los Angeles Office (LA)
Ceritos Corporate Tower
18000 Studebaker Rd., Room 660
Cerritos, CA 90701-3684

San Francisco Office (SF)
5653 Stoneridge Drive, Suite 105
Pleasanton, CA 94588-8543

COLORADO
Denver Office (DV)
215 S. Wadsworth Blvd., Suite 303
Lakewood, CO 80226-1544

FLORIDA
919 Federal Bldg
51 SE First Ave.
Miami, FL 33130

Tampa Office (TP)
2203 N. Lois Ave., Room 1215
Tampa, FL 33607-2356

GEORGIA
Atlanta Office (AT)
3575 Koger Blvd., Suite 320
Duluth, GA 30096-4958

HAWAII
7304 Prince Kuhi
Federal Building
Honolulu, HI

ILLINOIS
Chicago Office (CG)
Park Ridge Office Ctr., Room 306
1550 Northwest Highway
Park Ridge, IL 60068-1460

LOUISIANA
New Orleans Office (OR)
2424 Edenborn Ave. Suite 460
Metarie, LA 70001

MARYLAND
1017 Geo. Fallon
Building 31
Hopkins Plaza
Baltimore, MD

MASSACHUSETTS
Boston Office (BS)
1 Batterymarch Park
Quincy, MA 02169-7495

MICHIGAN
Detroit Office (DT)
24897 Hathaway Street
Farmington Hills, MI 48335-1552

MINNESOTA
691 Federal Building
316 N Robert St.
St. Paul, MN

MISSOURI
Kansas City Office (KC)
520 NE Colbern Road
Second Floor
Lee's Summit, MO 64086

NEW YORK
1307 Federal Building
111 W. Huron
Buffalo, NY 14202

NEW YORK
New York Office (NY)
201 Varick Street, Suite 1151
New York, NY 10014-4870

OREGON
1782 Federal Building
1220 SW 3rd Avenue
Portland, OR 97204

PENNSYLVANIA
Philadelphia Office (PA)
One Oxford Valley Office Bld.
Room 404
2300 E. Lincoln Hwy
Langhorne, PA 19047-1859

PUERTO RICO
747 Federal Building
Carlo Chardon Ave.
Hato Rey, PR 00918

TEXAS
Dallas Office (DL)
9330 LBJ Freeway, Room 1170
Dallas, TX 75243-3429

5636 Federal Building
515 Rusk Avenue
Houston, TX 77002

WASHINGTON DC
Columbia Office (CF)
9300 East Hampton Drive
Capitol Heights, MD 20743

WASHINGTON
Seattle Office (ST)
11410 NE 122nd Way
Room 312
Kirkland, WA 98034-6927

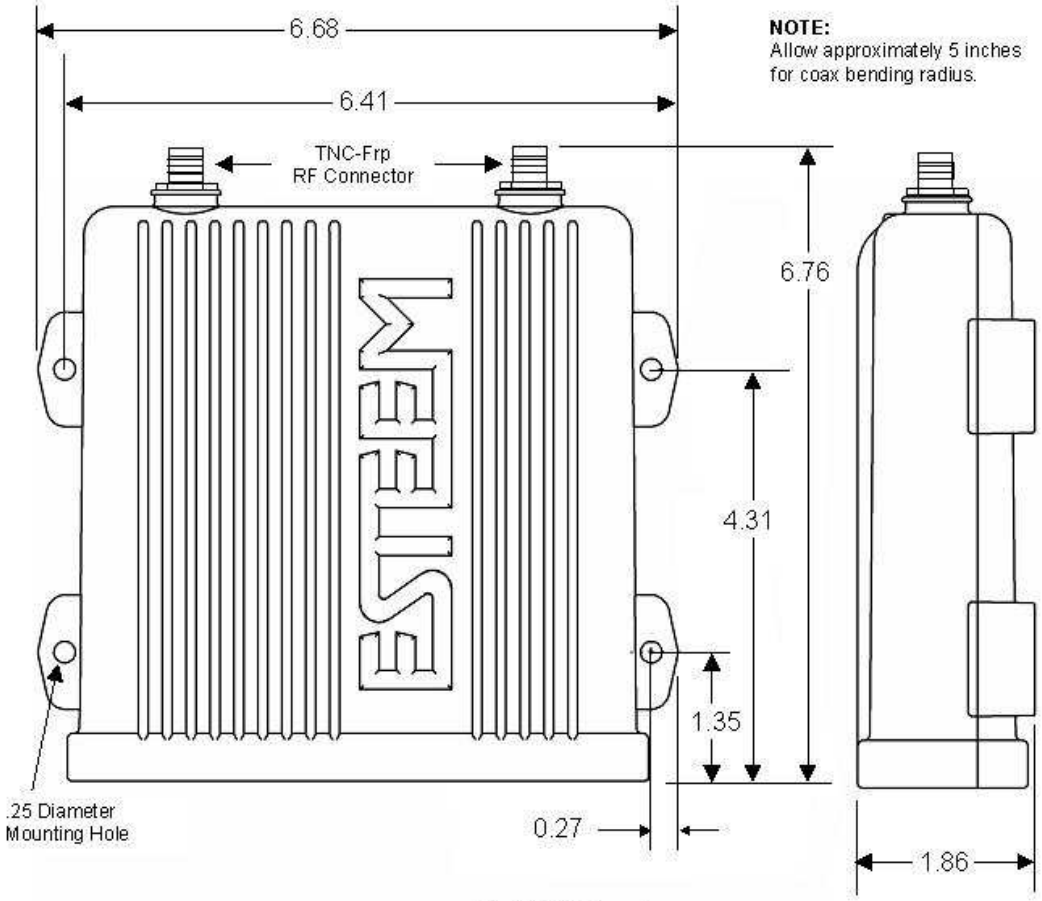
Model 195Eg Specifications

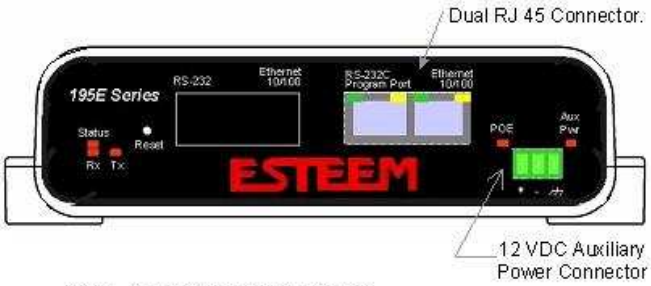
LED Indicators	
Power On/Off	Receiver On/Off
Carrier Detect On/Off	Transmitter On/Off
Link Status On/Off	
I/O Connectors	
Ethernet 10/100Base T	RJ-45
RS-232C Programming/Data Port	RJ-45
Dual Antenna input/Outputs	TNC Reverse Female
Remote Input Power	Power Over Ethernet Cable
Direct Input Power	Optional, Header Screw Connector
Transmiter	
Frequency of Operation	2.412 to 2.462 GHz Software Selectable in 11 Channels
RF Data Rates	1,2,5.5,6,9,11,12,18,24,36,48, & 54 Mbps Fixed or Auto Scaling
Tx Peak Output Power	1 Watt
RF Output Impedance	50 ohms
Receiver	
Rx Sensitivity	-68 dBm @54 Mbps to –89 dBm @ 1 Mbps Frame Error Rate <10%
Power	
Power over Ethernet	IEEE 802.3af Standard Power Supply, 48 VDC @ 13 Watts
Power Connector on Unit	10 to 16 VDC
Receive	320 ma @ 12 VDC
Transmit	1000 ma @ 12 VDC
Case	
Dimensions	1.9 in. H x 6.7 in. W x 6.2 in. L
Weight	1.25 lbs.
Outdoor Pole Mounting Kit	Optional, EST P/N 195PM
Other	
Warranty	1 Year
Temperature Range	-30° to +60° C
Humidity	95% Non-condensing
FCC Type Acceptance	ENPESTEEM195EG-1
Industry Canada Type Acceptance	1457A-195EG

The GPL source code contained in this product is available as a free download from the following: ftp://ftp.esteem.com/opensource/gplsourcepackage.tar.bz2
If you would like a copy of the GPL source code contained in this product shipped to you on CD, please send $9.99 to 415 N. Quay Street, Kennewick, WA 99336 which covers the cost of preparing and mailing a CD to you.

Specifications Subject to Change Without Notice

Model 195Eg Case Specifications





Note:
Left connector is used for RS-232C programming port.

Right side is the Ethernet interface port.

Note:
Auxiliary Power Plug with screw termination for wiring is available.

Note: All dimensions are in inches.

Antenna Specifications

Model No: AA01S
Antenna Type: Omni-Directional, variable angle rubber duck
Applications: Direct mount
Frequency: 2400 to 2485 MHz
Polarization: Vertical
Impedance: 50 ohms
Gain: Unity
VSWR: < 1.5
Front to Back Ratio: n/a
Horizontal Beamwidth: n/a
Vertical Beamwidth: n/a
Antenna Material: Rubber duct whip.
Mounting Hardware: n/a
Antenna Connector: TNC-R Male
Antenna Envelope: 4.25 in. length by 1.75 in width
Weight: .08 lbs.

Caution

Omni-directional antenna should not be located within 20 cm of personnel.

Model AA01S

Model: AA20DMEg
Applications: Model 195Eg direct case mount
Antenna Type: Omni-Directional, Sleeve dipole
Frequency: 2400 to 2485 MHz
Polarization: Vertical
Impedance: 50 ohms
Gain: 5 dBi (3 dBd)
VSWR: < 2:1
Power: 10 W
Front To Back Ratio: n/a
Horizontal Beamwidth: n/a
Vertical Beamwidth: n/a
Antenna Material: Polyurethane Plastic Radome
Recommended Mounting Hardware: n/a
Antenna Connector: TNC-R Male
Flexibility: +/- 20 °
Antenna Envelope: 8.28 in. length by .54 in. width
Temperature: -40 to +70 C°
Weight: 33 grams

Caution

Omni-directional antenna should not be located within 20 cm of personnel.

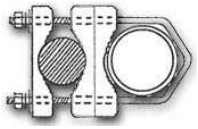
Model AA20DMEg

Antenna Specifications

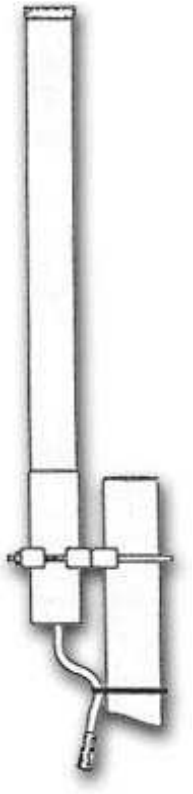
Model No:	AA20Eg
Antenna Type:	Omni Directional, DC Grounded
Applications:	Fixed base
Frequency:	2400 to 2500 MHz
Polarization:	Vertical
Impedance:	50 ohms
Gain:	6 dBi (4dBd)
VSWR:	1.2:1 Typical
Front to Back Ratio:	n/a
Horizontal Beamwidth:	n/a
Vertical Beamwidth:	40 degrees @ ½ power
Antenna Material:	Brass radiator, UV inhibited fiberglass enclosed
Mounting Hardware:	Base to Mast, Supplied.
Antenna Connector:	TNC-R Male with 36in. pig-tail.
Antenna Envelope:	12 in. length by 1 in. diameter
Weight:	1.5 lbs.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna and all persons.



Mounting Bracket



Model AA20Eg

Antenna Specifications

Model No:	AA203Eg
Antenna Type:	Directional, DC grounded
Applications:	Fixed base.
Frequency:	2400 to 2485 MHz
Polarization:	Vertical or Horizontal
Impedance:	50 ohms
Gain:	6 dBi (4 dBd)
VSWR:	< 1.5
Front to Back Ratio:	>23 dB
Horizontal Beamwidth:	55 degrees @ ½ power
Vertical Beamwidth:	55 degrees @ ½ power
Antenna Material:	Sealed in UV stable fiberglass enclosed radome
Mounting Hardware:	Stainless steel U bolts (included) for mounting up to 1 5/8 in. diameter pipe.
Antenna Connector:	TNC-R Male with 36in. pig tail
Maximum Power Input:	5 Watts
Antenna Envelope:	4.5 in. length by 3 in. diameter
Windload (RWV):	125 mph
Lateral Thrust at Rated Wind:	5.8 lbs.
Wind Surface Area:	0.060 ft^2
Weight:	1 lbs.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna and all persons.

Model AA203Eg

Antenna Specifications

Model No:	AA204Eg
Applications:	Fixed base mounting
Antenna Type:	2.4 GHz ISM, Directional, DC Grounded, Parabolic Grid
Frequency:	2400-2485 MHz
Polarization:	Vertical or Horizontal
Impedance:	50 ohms
Gain:	19 dBi (17 dBd) nominal
VSWR:	< 1.5:1 nominal
Front to Back Ratio:	>24 dB
Horizontal Beamwidth:	16 degrees @ ½ power
Vertical Beamwidth:	11 degrees @ ½ power
Antenna Material:	Zinc plated cold rolled steel with polyester power coat finish
Recommended Mounting Hardware:	Standard U-bolt steel mast clamp complete with mounting hardware. Designed for masts of up to 2.5 in. O.D.
Antenna Connector:	TNC-R Male with 36 in. pig-tail
Maximum Power Input:	10 Watts
Wind Survival:	100 mph
Wind Load:	16 mph
Antenna Envelope:	34 in. length by 17 in. width by 11 in. height
Weight:	3 lbs.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 50 cm must be maintained between the antenna and all persons.

Model AA204Eg

Use of the AA204Eg, directional antenna is limited to fixed point-to-point applications only. In accordance with FCC Section 15.247(b)iii, this antenna must be professionally installed. The installer must ensure the system is used exclusively for fixed, point-to-point applications and the ESTeem Model 195Eg is set for 0.25 Watts output power (Power Level = Min).

Antenna Specifications

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna and all persons

Model No:	AA20E
Antenna Type:	Omni Directional, DC Grounded
Applications:	Fixed base
Frequency:	2400 to 2500 MHz
Polarization:	Vertical
Impedance:	50 ohms
Gain:	6 dBd
VSWR:	< 1.5
Front To Back Ratio:	n/a
Horizontal Beamwidth:	n/a
Vertical Beamwidth:	35 degrees @ ½ power
Antenna Material:	Copper alloy radiator, UV inhibited fiberglass enclosed
Mounting Hardware:	Aluminum bracket for mounting to 1 ¼ to 2 in. diameter mast included.
Antenna Connector:	N female reverse polarity.
Antenna Envelope:	20 in. length by 1.35 in. diameter
Weight:	2 lbs.

Mounting Bracket

Model AA20E

Only pre-made coax cables from the factory used in conjunction with either the AA20E omni-directional and AA203ES or AA204ES directional antennas meet all FCC Section 15.247(b) EIRP maximum power requirements. See Chapter 8 for details on maximum cable lengths.

Antenna Specifications

Model No:	AA203ES
Antenna Type:	Directional, 6 element yagi, DC grounded
Applications:	Fixed base.
Frequency:	2400 to 2483.5 MHz
Polarization:	Vertical or Horizonal
Impedance:	50 ohms
Gain:	7 dBd
VSWR:	< 1.5
Front To Back Ratio:	13.5 dB
Horizontal Beamwidth:	47 degrees @ ½ power
Vertical Beamwidth:	55 degrees @ ½ power
Antenna Material:	Sealed in UV stable fiberglass enclosed radome
Mounting Hardware:	Stainless steel U bolts (included) for mounting up to 1 5/8 in. diameter pipe.
Antenna Connector:	N male reverse polarity with 18 in. pig tail
Maximum Power Input:	50 Watts
Antenna Envelope:	7 1/4 in. length by 2.0 in. diameter
Windload (RWV):	120 mph
Lateral Thrust at Rated Wind:	12.2 lbs.
Wind Surface Area:	0.146 ft^2
Bending Moment at Base Rated Wind:	3.6 lb-ft.
Weight:	.48 lbs.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 100cm must be maintained between the antenna and all persons.

Model AA203ES

Only pre-made coax cables from the factory used in conjunction with either the AA20E omni-directional and AA203ES or AA204ES directional antennas meet all FCC Section 15.247(b) EIRP maximum power requirements. See Chapter 8 for details on maximum cable lengths.

Antenna Specifications

Model No:	AA204ES
Applications:	Fixed base mounting
Antenna Type:	2.4 GHz ISM, Directional, 16 Element Yagi, DC Grounded
Frequency:	2400-2483.5 MHz
Polarization:	Vertical or Horizontal
Impedance:	50 ohms
Gain:	13.5 dBi (11.3 dBd nominal)
VSWR:	< 2.1, 1.5:1 nominal
Front To Back Ratio:	>20 dB
Horizontal Beamwidth:	28 degrees @ ½ power
Vertical Beamwidth:	30 degrees @ ½ power
Antenna Material:	Fiberglass enclosed
Recommended Mounting Hardware:	Heavy duty U bolts for mounting up to 1 5/8 in. pipe (included). Adjustable yagi mounting kit for mounting up to 1 ½ in. pipe optional
Antenna Connector:	N male reverse polarity
Cable Length:	18 in.
Maximum Power Input:	50 Watts
Wind Survival:	120 mph
Antenna Envelope:	18 in. length by 3 in. width
Equiv. Flat Plate Area:	0.375 ft²
Lateral Thrust at Rated Wind:	31.4 lbs.
Bendling Moment at Base Rated Wind:	23.6 lb-ft.
Weight:	.76 lbs.

Caution

To comply with the FCC exposure compliance requirements, a separation distance of at least 100cm must be maintained between the antenna and all persons.

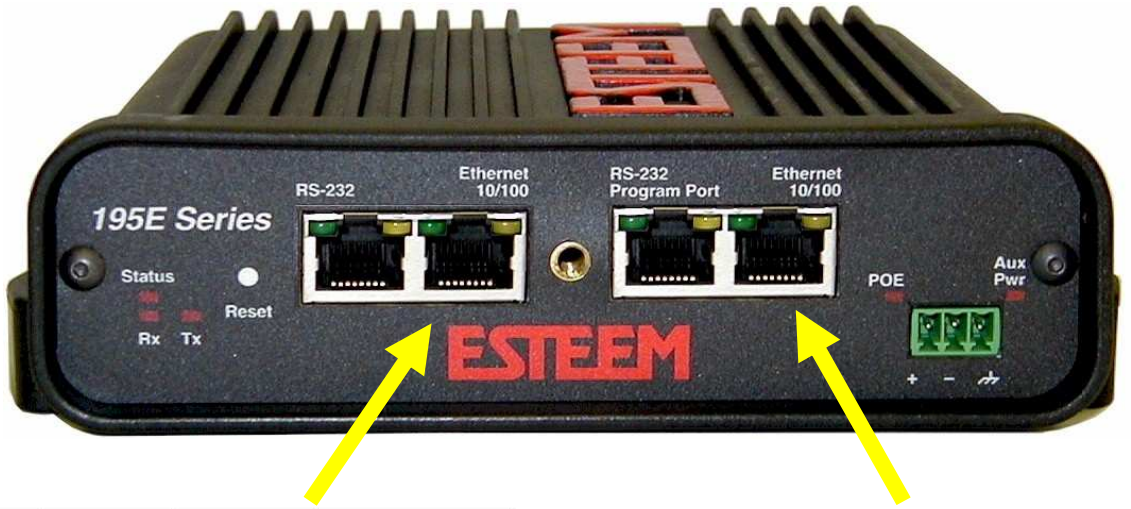
Model 204ES

Only pre-made coax cables from the factory used in conjunction with either the AA20E omni-directional and AA203ES or AA204ES directional antennas meet all FCC Section 15.247(b) EIRP maximum power requirements. See Chapter 8 for details on maximum cable lengths.

Use of the AA204ES, directional antenna is limited to fixed point to point applications only. In accordance FCC Section 15.247(b)iii, the operator or installer is responsible for ensuring the systems is used exclusively for fixed, point-to-point applications.

ETHERNET INTERFACE

The ESTeem Model 195Eg's Ethernet Port is a Full and Half-Duplex Auto-negotiation interface supporting both 10 Mbps and 100 Mbps (10/100BaseT). The Ethernet port is compliant with IEEE 802.3af Power Over Ethernet (PoE) to provide both data and power over the same CAT-5E grade Ethernet cable. The port is compatible with TIA/EIA-568B cable configuration (Figure 1).



RJ45 Pin No.	Wire Color	Wire Diagram	10Base-T Signal 100Base-TX Signal
1	White/Orange		Transmit +
2	Orange		Transmit -
3	White/Green		Receive +
4	Blue		Unused
5	White/Blue		Unused
6	Green		Receive -
7	White/Brown		Unused
8	Brown		Unused

RJ45 Pin No.	Wire Color	Wire Diagram	10Base-T Signal 100Base-TX Signal
1	White/Orange		Transmit +
2	Orange		Transmit -
3	White/Green		Receive +
4	Blue		+ Power
5	White/Blue		+ Power
6	Green		Receive -
7	White/Brown		- Power
8	Brown		- Power

Figure 1: Ethernet Pin Layout

A second Ethernet port will be included if the serial option is added to the 195Eg. This second Ethernet port can be used in Bridge Mode (HUB) or as a router.

CONFIGURING DHCP SERVER

The ESTeem 195Eg Ethernet port supports both client and server Dynamic Host Configuration Protocol (DHCP). Figure 2 shows the DHCP host configuration screen that will be shown if DHCP server is selected in the setup screens. Enter the values that match the DHCP configuration for your network.

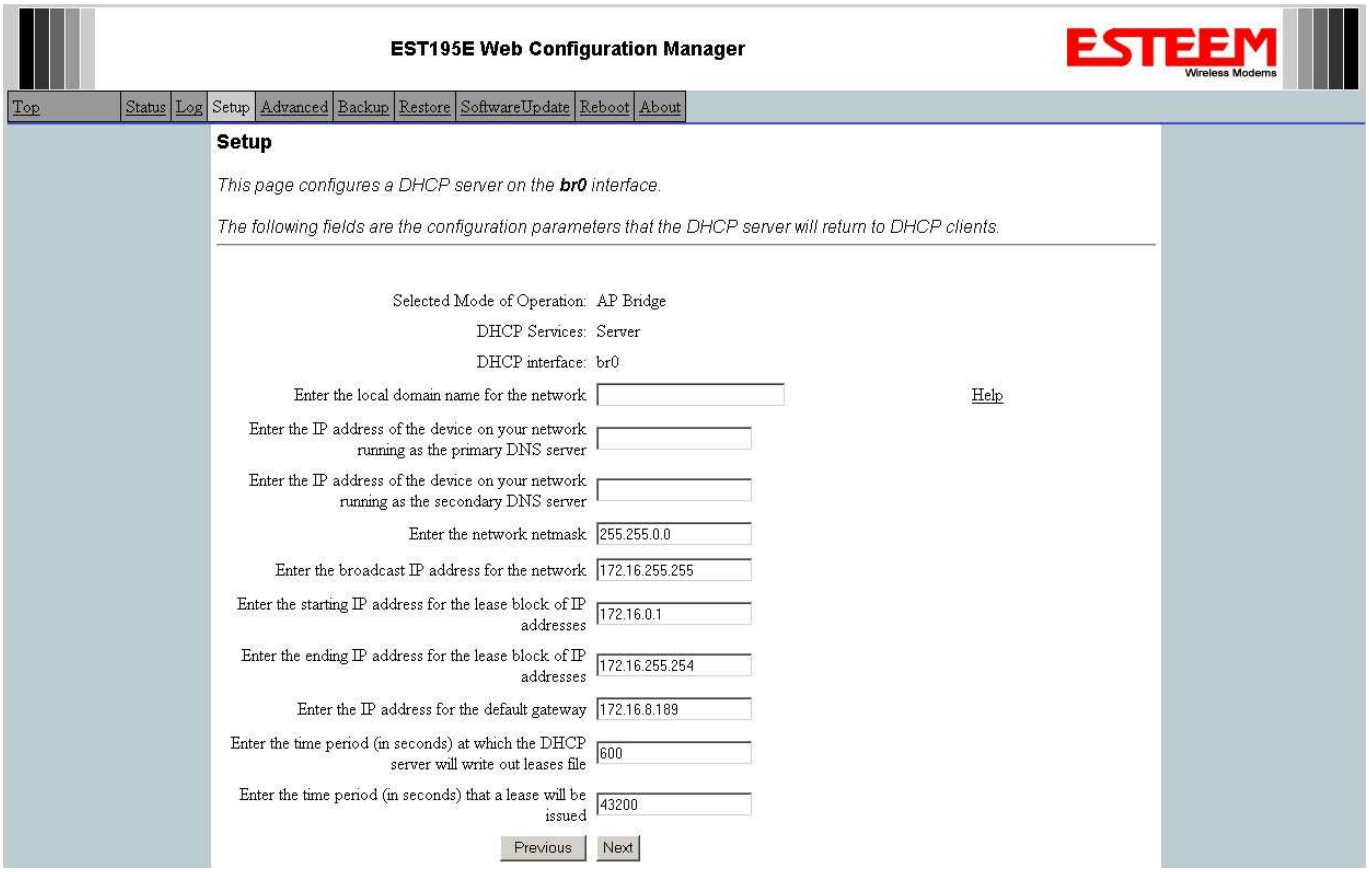

EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup
This page configures a DHCP server on the br0 interface.
The following fields are the configuration parameters that the DHCP server will return to DHCP clients.
Selected Mode of Operation: AP Bridge
DHCP Services: Server
DHCP interface: br0
Enter the local domain name for the network
Help
Enter the IP address of the device on your network running as the primary DNS server
Enter the IP address of the device on your network running as the secondary DNS server
Enter the network netmask 255.255.0.0
Enter the broadcast IP address for the network 172.16.255.255
Enter the starting IP address for the lease block of IP addresses 172.16.0.1
Enter the ending IP address for the lease block of IP addresses 172.16.255.254
Enter the IP address for the default gateway 172.16.8.189
Enter the time period (in seconds) at which the DHCP server will write out leases file 600
Enter the time period (in seconds) that a lease will be issued 43200
Previous
Next

Figure 2: DHCP Server Configuration

RS-232C PROGRAMMING PORT CONFIGURATION

The ESTeem Model 195Eg has a proprietary RS-232C interface in a RJ-45 connector on the front panel. To interface the 195Eg to the serial port on the computer, you need ESTeem cable AA0621 that combines a standard Ethernet patch cable to a 9-pin Female adapter.

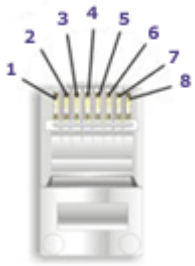
The serial port on the ESTeem Model 192E can be used to access the configuration menu in the ESTeem for system and network configuration. The ESTeem communications port operates at 38,400 bps, No Parity, 8 Data Bits and 1 Stop Bit (38,400,N,8,1). Configure your terminal program to match these settings.

Model 195Eg Serial Port Interface

RS-232 PROGRAMMING PORT PIN-OUT TABLE

ESTeem Model AA0621
RS-232C Port Pin-Out Table

RJ-45 Pin No.	Function	DB-9 Pin No.
4	Signal Ground (GND)	5
5	Receive Data (RxD)	2
6	Transmit Data (TxD)	3



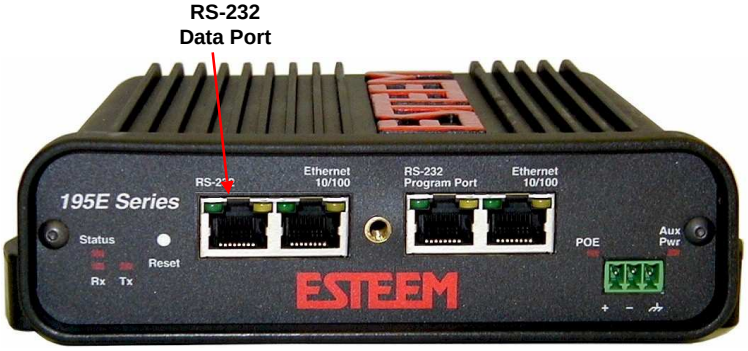
Ethernet Pin-out

RS-232C DATA PORT CONFIGURATION

The ESTeem Model 195Eg has an RS-232C interface in a RJ-45 connector on the front panel that can be installed as an option . To interface the 195Eg to the serial port on the computer, you need serial cable with the following pin-out:

ESTeem Model AA0621
RS-232C Port Pin-Out Table

RJ-45 Pin No.	Function	DB-9 Pin No.
1	Data Set Ready (DSR)	6
2	Data Carrier Detect (DCD)	1
3	Data Terminal Ready (DTR)	4
4	Signal Ground (GND)	5
5	Receive Data (RxD)	2
6	Transmit Data (TxD)	3
7	Clear to Sent (CTS)	8
8	Request to Sent (RTS)	7



Model 195Eg Serial Data Port Interface

195Eg FREQUENCY OF OPERATION

In a wireless Ethernet network all of the ESTeem Model 195Eg's must be set to the same radio frequency of operation or channel. Listed on the right is a table showing the channel and corresponding frequency of operation. The frequency of operation is selectable when configuring the mode of operation of the 195Eg (reference Chapter 4). See Figure 1.

Channel Number	Frequency
1	2412 MHz
2	2417 MHz
3	2422 MHz
4	2427 MHz
5	2432 MHz
6	2437 MHz
7	2442 MHz
8	2447 MHz
9	2452 MHz
10	2457 MHz
11	2462 MHz

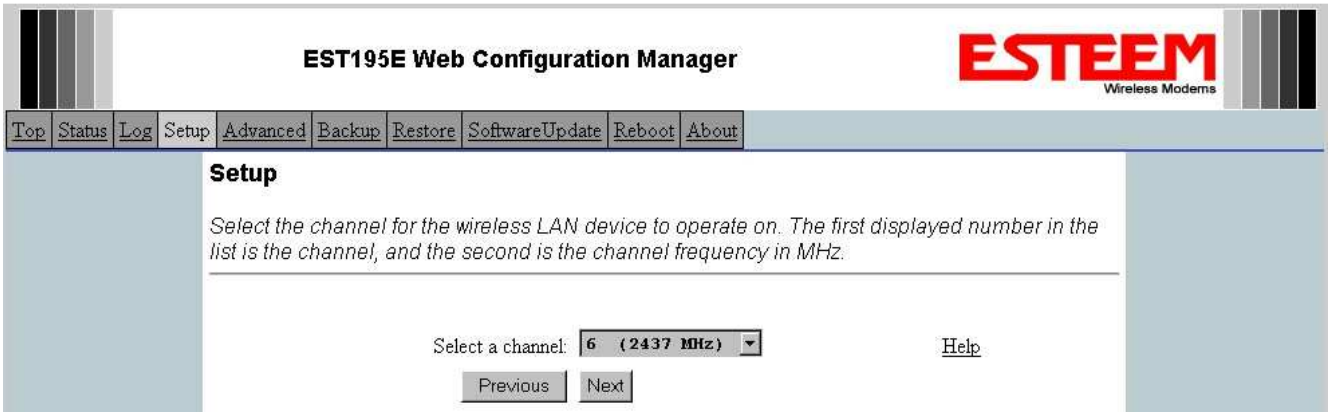


Figure 1: RF Channel Selection

RF COMMUNICATIONS DATA RATE

The RF data rate of the Model 195Eg can be programmed for operation at 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. The RF data rate can be set for a fixed rate or a specific range that is dynamically scaled by the Model 195Eg from monitoring the received signal quality. The Model 195Eg can communicate with multiple 802.11g devices at different data rates for each device. By selecting all ranges from 1 to 54 Mbps you will be able to communicate with all 802.11g and 802.11b devices regardless of their generation, data rate, and signal quality requirements.

Dynamic scaling means that the Model 195Eg will operate at the highest RF data rate that is programmed into unit. If the received data quality drops below the required minimums for reliable communications the Model 192E will reduce the data rate to the next lowest step to increase signal quality. Conversely if the signal quality increases above the minimums the Model 192E will increase the RF data rate the next highest level.

The ESTeem 195Eg is set at the factory to operate at maximized scaling speed data rates from 1-54 Mbps and should not need adjustment. The RF Data Rate is programmed in the Model 195Eg through the **Advanced Menu>Wireless LAN Settings>Wlan0 Device** and the value for **wlan0_OPRATES:**. In the example shown in Figure 2 the RF Date Rate is programmed to dynamic scale from 1 to 54 Mbps (recommend factory default setting). To set the values for the data rate, check the box next to the listed data rate to enable this rate for operation.

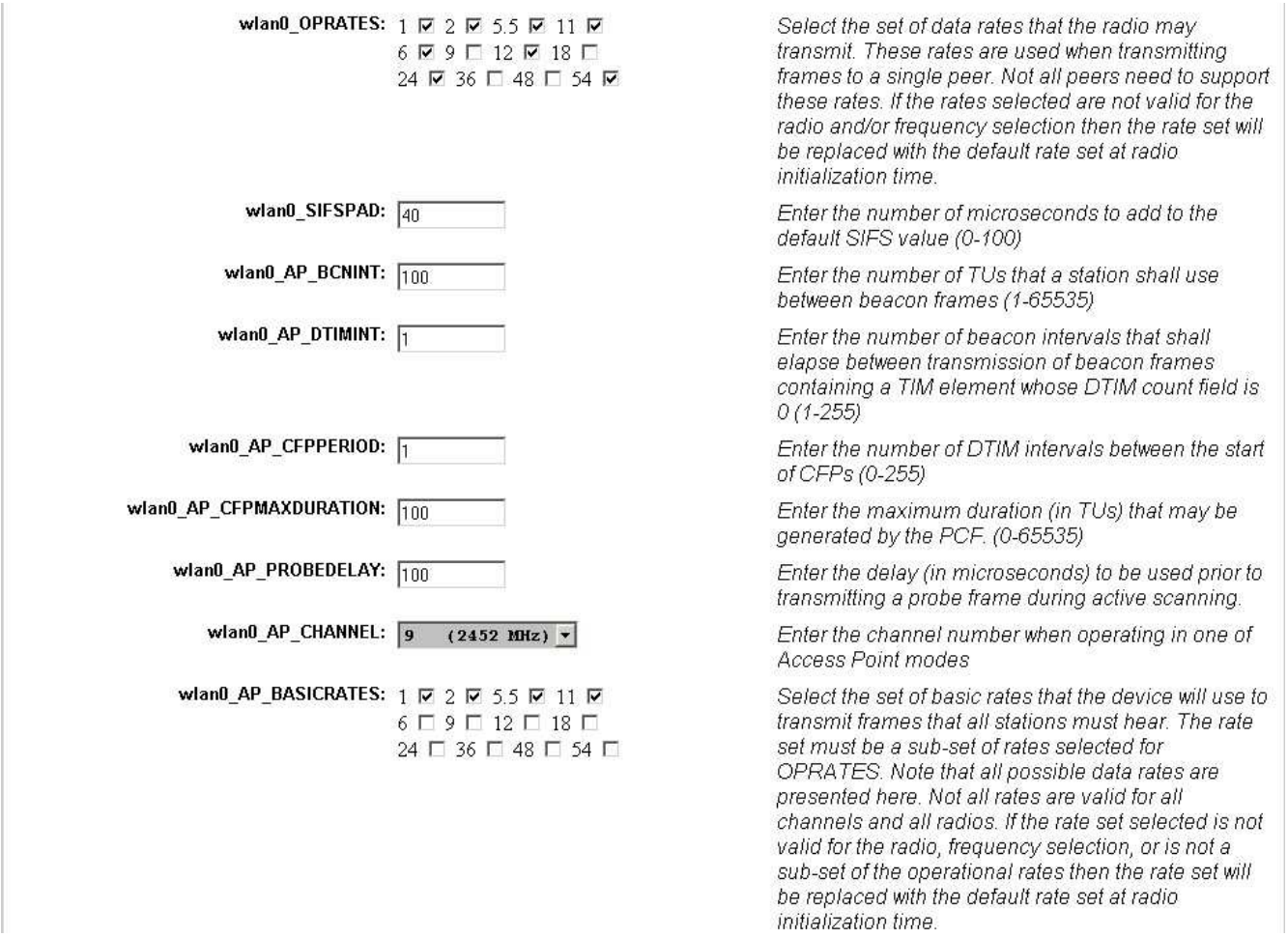

wlan0_OPRATES: 1 2 5.5 11
6 9 12 18
24 36 48 54
Select the set of data rates that the radio may transmit. These rates are used when transmitting frames to a single peer. Not all peers need to support these rates. If the rates selected are not valid for the radio and/or frequency selection then the rate set will be replaced with the default rate set at radio initialization time.
wlan0_SIFSPAD: 40
Enter the number of microseconds to add to the default SIFS value (0-100)
wlan0_AP_BCNINT: 100
Enter the number of TUs that a station shall use between beacon frames (1-65535)
wlan0_AP_DTIMINT: 1
Enter the number of beacon intervals that shall elapse between transmission of beacon frames containing a TIM element whose DTIM count field is 0 (1-255)
wlan0_AP_CFPPERIOD: 1
Enter the number of DTIM intervals between the start of CFPs (0-255)
wlan0_AP_CFPMAXDURATION: 100
Enter the maximum duration (in TUs) that may be generated by the PCF. (0-65535)
wlan0_AP_PROBEDELAY: 100
Enter the delay (in microseconds) to be used prior to transmitting a probe frame during active scanning.
wlan0_AP_CHANNEL: 9 (2452 MHz)
Enter the channel number when operating in one of Access Point modes
wlan0_AP_BASICRATES: 1 2 5.5 11
6 9 12 18
24 36 48 54
Select the set of basic rates that the device will use to transmit frames that all stations must hear. The rate set must be a sub-set of rates selected for OPRATES. Note that all possible data rates are presented here. Not all rates are valid for all channels and all radios. If the rate set selected is not valid for the radio, frequency selection, or is not a sub-set of the operational rates then the rate set will be replaced with the default rate set at radio initialization time.

Figure 2: Advanced Data Rate Selection

RF BASIC RATE

The RF Basic Rate is the synchronization rate used to establish the initial connection between 802.11g and 802.11b communication devices in Mbps. After the initial connection has been establish the RF communication rate will be determined by the RF Communication Data Rate established above. Factory default is 1 through 11 Mbps shown in Figure 2 so that the unity will establish communication with the older (slower) 802.11b devices. This lower rate also allows for a quicker reconnect when the ESTeems are configured for EtherStation mode or working in a mobile environment.

The ESTeem 195Eg is set at the factory to operate at all speeds from 1-11 Mbps and should not need adjustment. The RF Basic Rate is programmed in the Model 195Eg through the **Advanced Menu>Wireless LAN Settings>Wlan0 Device** and the value for **wlan0_AP_BASICRATES:**. In the example shown in Figure 2 the RF Date Rate is programmed to dynamic scale from 1 to 11 Mbps (recommend factory default setting). To set the values for the data rate, check the box next to the data rate required.

Note: The Model 195Eg will only communicate with slower speed devices after synchronization if the RF Communication Data shown above has been set to dynamically scale to 1 and 2 Mbps.

*In general, do **not** set the RF Basic Rates above 11Mbps unless specifically instructed by ESTeem Customer Support.*

SETTING RF POWER LEVEL

The ESTeem Model 195Eg peak power is adjustable in output power from 250mW to 1 Watt. The output power is adjusted on the **Advanced Menu>Wireless LAN Settings>Wlan0 Device** screen (Figure 3) of the Web Configuration Manager. Select the value and press the *Save Settings* button.

Max (Maximum)	1 Watt
Hi (High)	≈700 mw
Lo (Low)	≈500 mw
Min (Minimum)	≈250 mw

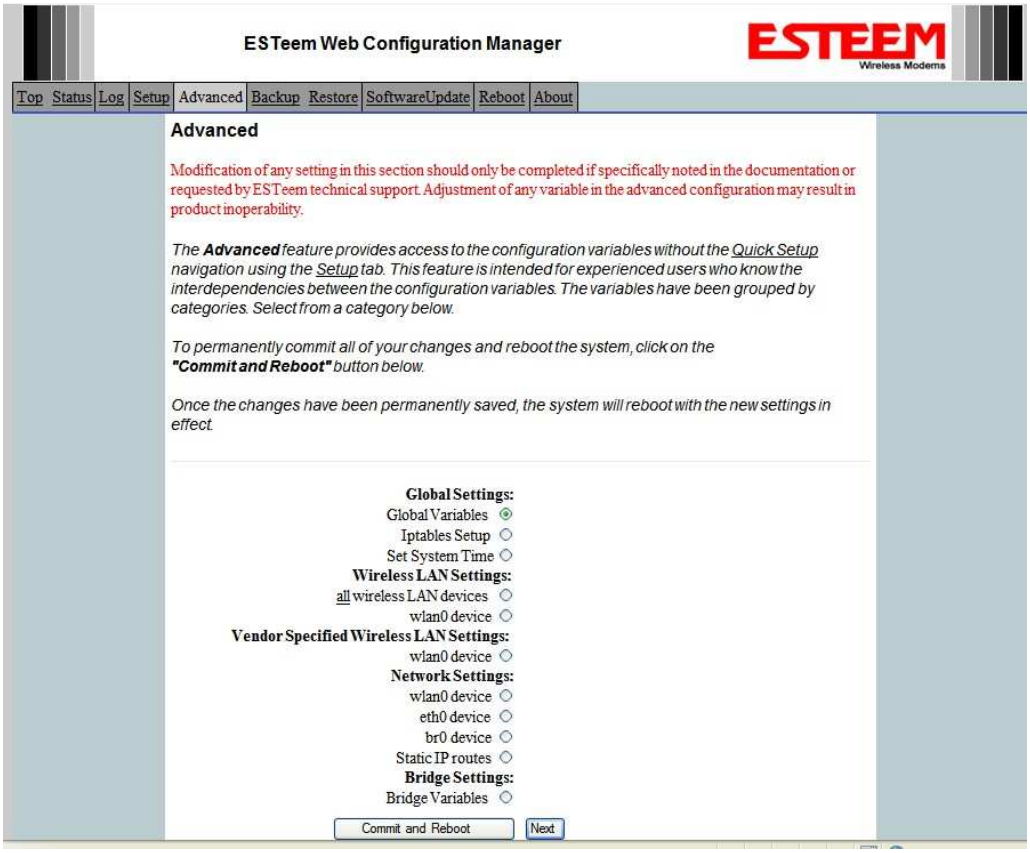

ESTeem Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 3: Advanced Global Variables

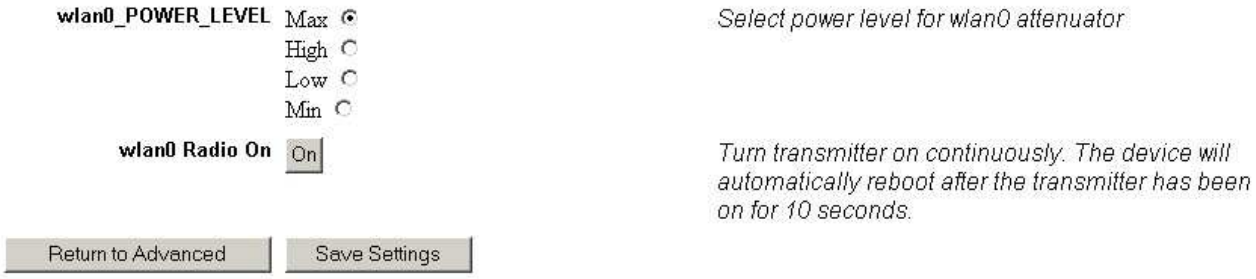


Figure 4: Power Level Settings

AVERAGE RF OUTPUT POWER

The average measurable output power on the ESTeem Model 195Eg will vary from 24dBm to 30dBm depending upon modulation type and RF data rate. The average power is used when entering the output power level in the ESTeem RF Design program. The following table provides that level and modulation type at each data rate:

RF Data Rate (Mbps)	Average Power	Modulation Type
1	30dBm	BPSK
2	30dBm	BPSK
5.5	30dBm	BPSK
6	30dBm	OFDM
9	30dBm	OFDM
11	30dBm	BPSK
12	28dBm	OFDM
18	28dBm	OFDM
24	27dBm	OFDM
36	27dBm	OFDM
48	24dBm	OFDM
54	24dBm	OFDM

OVERVIEW

The security for the ESTeem Model 195Eg, like all network security, must be multi-layered. One level of security is never enough to make sure that data does not end up in the wrong hands. Please review the following security levels and decide what is the most appropriate for your network.

AES-CCMP (802.11i and WPA-2)

AES-CCMP (Advanced Encryption Standard-Counter Mode CBC-MAC Protocol) is the encryption algorithm used in the IEEE 802.11i and WPA-2 security protocols. This national encryption standard uses a 128 bit-AES block cipher and CCMP technique to ensure the highest level of security and integrity available on a wireless network. AES-CCMP incorporates two sophisticated cryptographic techniques (counter mode and CBC-MAC) and adapts them to Ethernet frames to provide a robust security protocol between the mobile client and the access point. AES itself is a very strong cipher, but counter mode makes it difficult for an eavesdropper to spot patterns, and the CBC-MAC message integrity method ensures that messages have not been tampered with. The ESTeem 195Eg is compatible as either an Access Point or client in either WPA2 or IEEE 802.11i security systems.

Wi-Fi Protected Access 2 with Preshared Key (WPA2 PSK)
WPA2 PSK uses a common passphrase (preshared key) between the Access Point (AP) and the client to begin a secure communication session. This passphrase must be entered exactly the same in both the Access Point and the client. This passphrase is used to authenticate communication session between the AP and client to begin the secure wireless networking session.

Wi-Fi Protected Access 2 with Enterprise Server (WPA Enterprise)
Like WPA2 PSK, WPA2 Enterprise verifies the authenticity of the Access Point and client, but uses an 802.1x backend authentication server handling the authentication decision. The most commonly type of authentication server is a RADIUS server. The ESTeem Model 195Eg can be configured to operate with an established RADIUS server on the network.

WPA

Wi-Fi Protected Access with Preshared Key (WPA PSK)
WPA, which uses 802.1x, was introduced in 2003 to improve on the authentication and encryption features of WEP. All authentication is handled within this access point device. WPA has two significant advantages over WEP:

1. An encryption key differing in every packet. The TKIP (Temporal Key Integrity Protocol) mechanism shares a starting key between devices. Each device then changes their encryption key for every packet. It is extremely difficult for hackers to read messages even if they have intercepted the data.
2. Certificate Authentication (CA) can be used, blocking a hacker posing as a valid user.

Wi-Fi Protected Access with Enterprise Server (WPA Enterprise)
Like WPA PSK, WPA Enterprise verifies the authenticity of the Access Point and client, but uses an 802.1x backend authentication server handling the authentication decision. The most commonly type of authentication server is a RADIUS server. The ESTeem Model 195Eg can be configured to operate with an established RADIUS server on the network.

WPA is server/client relationship from a software driver on a computer's wireless LAN (WLAN) card to an Access Point. The scope of WPA is limited in use to this configuration only. The ESTeem Model 195Eg can support WPA Enterprise and PSK as an Access Point, but the level of security on the Bridging layer is configured separately.

128-BIT WEP

The 128 WEP uses a particular algorithm called RC4 encryption to encode and decode traffic that is based on a 104-bit encryption key and a 24-bit Initialization Vector (IV). RC4 starts with a relatively short encryption key (104 bits) that is expanded into a nearly infinite stream of keys to accompany the stream of packets.

The basic concept of RC4 is good, but the way it's implemented in WEP leaves it open to compromise. The researchers that test the integrity of the system usually focus on one piece of the implementation, the Initialization Vector (IV).

The IV (24 bits) is the algorithm component that's supposed to keep expanded keys from repeating. From the researcher's point of view, a high-volume access point is mathematically guaranteed to reuse the same key stream at least once a day. When this happens, it's called an IV collision this becomes a soft spot to enter the system.

The researchers aren't saying that it's easy to break into the system, or that it's being done on a regular basis, only that it is possible and that administrators should consider ways to reduce the possibility

ACCESS CONTROL LIST (ACL)

The ACL is one of the simplest yet most secure methods of network security. The ACL is a configurable MAC filter in the Model 192E that can be set to allow specific MAC address on the wireless network by individual address or address ranges. The same filter can also be set to reject individual MAC addresses or address ranges.

The MAC address is a unique, 6 hexadecimal field address assigned at the manufacturer that can not be changed. The MAC address is traceable through the IEEE governing body to the manufacturer and is the "fingerprint" for all Ethernet devices.

Using a combination of both the WPA or 128-Bit WEP encryption and the ACL filter provide the ESTeem an extremely secure wireless networking layer.

DISABLING BROADCAST PROBES AND HIDING SSID

A simple but very effective way of securing a network is to make the network difficult to find. By disabling broadcast probes and hiding the Service Set Identification (SSID), wireless and network "sniffers" will not be able to find your ESTeem Model 195Eg network. To gain access to the wireless network, you would be required to have the SSID and all security loaded in the WLAN card software prior to entering the network.

PROPRIETARY BRIDGE COMMUNICATION

Although the ESTeem Model 195Eg is compatible with the open communication standards IEEE 802.11g and 802.11b, the repeater communication between the units is a proprietary communication link. No other manufacturer of wireless hardware can access the ESTeem repeater network when bridging between Ethernet networks. This proprietary communication layer, in combination with the other security settings, allows you as the user to reject wireless clients into the network if so desired. When used in conjunction with the Access Control List the 802.11g and 802.11b client access can be removed.

The security level of the bridge communication link is configurable for 64-Bit WEP, 128-Bit WEP or TKIP and is completely independent of the client access level or any other communication link level. For example, an ESTeem Model 195Eg can be configured for WPA Enterprise for client level access, communicate to another ESTeem Model 195Eg using a TKIP bridge link and also communicate 128-Bit WEP to our older ESTeem Model 192E radio modems all running simultaneously.

MASQUERADE MODES

When the ESTeem Model 195Eg is configured in either the Access Point Masquerade or the Client Masquerade modes, the wireless modem functions as a network firewall. If access to the wired network is the greatest concern, place the ESTeem in the Masquerade mode and the wireless network will be completely isolated from the wired Ethernet network.

INCREASING NETWORK SECURITY

The following are a few suggestions to help improve the overall security of your wireless network:

1. Enable the security. If you research all of the articles regarding hackers, they have gotten into the user's network due to the security not being enabled.

2. Set the ACL filter to include only those MAC address of the wireless Ethernet device being used on the network.

3. Make sure the keys are not reused in your company, since reuse increases the statistical likelihood that someone can figure the key out and change the default password on your access point or wireless router

4. As a network administrator, you should periodically survey your company using a tool like NetStumbler to see if any "rogue" access points pop up within your company without authorization. All of your hard work to "harden" your wireless network could be wasted if a rogue AP was plugged into your network behind the firewall.

5. Many access points allow you to control access based on the MAC address of the NIC attempting to associate with it. If the MAC address of your NIC isn't in the table of the access point, you won't associate with it. And while it's true that there are ways of spoofing a MAC address that's been sniffed out of the air, it takes an additional level of sophistication to spoof a MAC address. The downside of deploying MAC address tables is that if you have a lot of access points, maintaining the tables in each access point could be time consuming. Some higher-end, enterprise-level access points have mechanisms for updating these tables across multiple access points of the same brand.

6. Consider using an additional level of authentication, such as Remote Access Dailin User Service (RADIUS), before you permit an association with your access points through WPA and WPA2 Enterprise.

7. If you're deploying a wireless router, think about assigning static IP addresses for your wireless NICs and turn off Dynamic Host Configuration Protocol (DHCP). If you're using a wireless router and have decided to turn off DHCP, also consider changing the IP subnet. Many wireless routers default to the 192.168.1.0 network and use 192.168.1.1 as the default router.

8. Only purchase Access Points that have flashable firmware. There are a number of security enhancements that are being developed, and you want to be sure that you can upgrade your access point.

9. A simple security technique used by the military is to have the administrator periodically change the key for the system i.e. weekly, monthly, etc.

TESTING COMMUNICATION LINK

After you have configured at least two of the Model 195Eg wireless Ethernet modems for operation, you can verify communication with each the following steps:

Status Light

The quickest source of link status is to view the Status Light on the face of the 195Eg (Figure 1). If the Status light is solid, the Model 195Eg has a connection to another Model 195Eg listed in the Peer Table.

Figure 1: Connection Status Light

Status Screen/Peer Table

To view detailed information on the status of the communication link (such as connection speed, signal strength and last update time) you can open the Status Screen from the Web Interface. After press the Status tab at the top of the screen the Status: Summary will be displayed showing the status of all ports and memory in the 195Eg. Under the Wireless Status heading click on the View Peer Table (Figure 2). The Peer Table will list all other 802.11b or 802.11g wireless activity seen by the 195Eg and how it is classified.

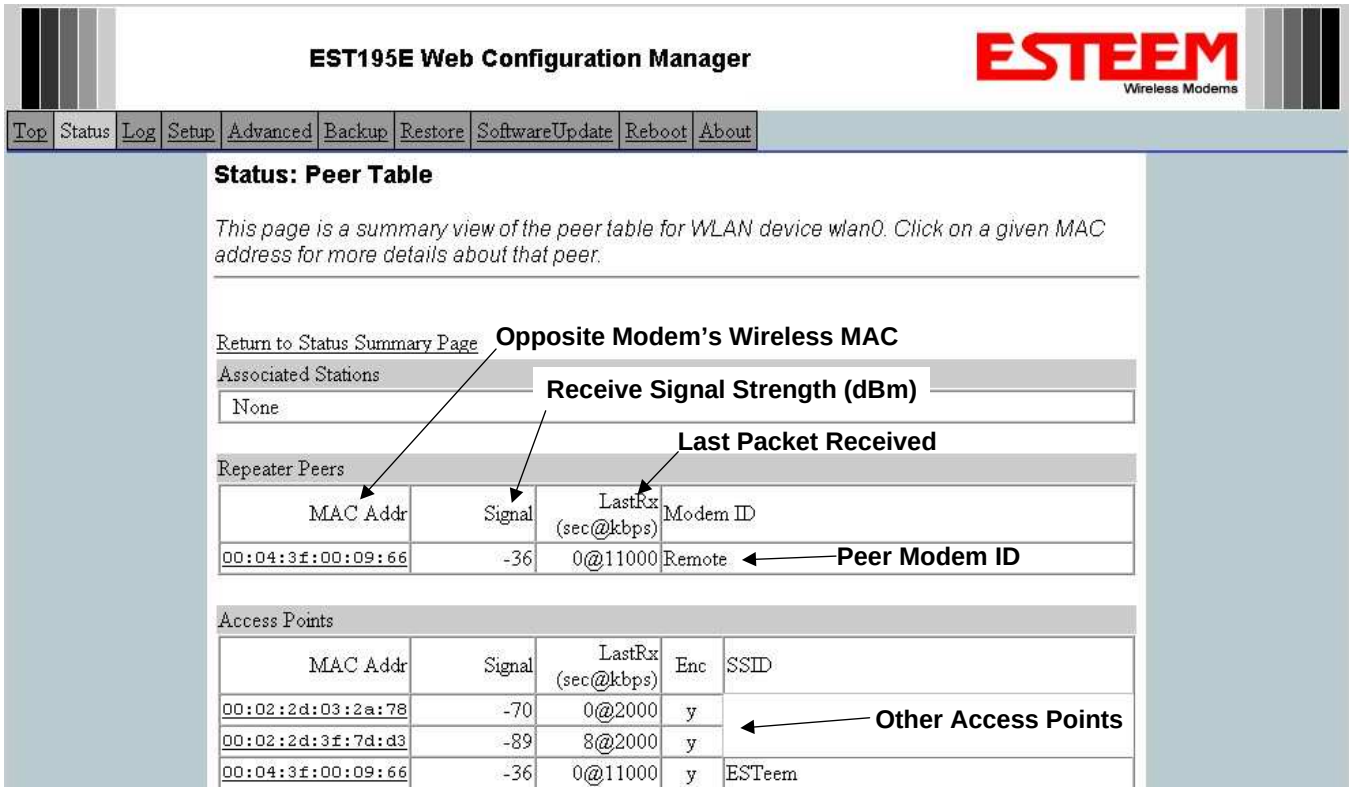


Figure 2: Repeater Peer Table

***Note**: The data rate displayed is **not necessarily** indicative of the RF data rate between the ESTeems. The rate show in the Repeater Peer table will be the last RF packet, which could consist of either data, repeater beacon or network probes.*

Repeater Peers - The Peer Table will display all connected 195Egs configured to repeat to this ESTeem by their Wireless (WLAN) MAC address.

Received Signal Strength – This is the first of the two numbers listed in the block. This signal strength value is listed in dBm.

Last RX – This is the time of the last received data packet. When monitoring the status menu, it is important to note the time the last transmission was updated so you are not looking at "stale" data.

Current Data Rate – This is the current speed the last data packet received by the Model 195Eg. This may not be the data rate between the radio modems. Note that the speed is listed in kbps, so that 11000 kbps is equal to 11 Mbps.

***Note**: The ESTeem Model 195Eg uses spread spectrum technology that analyzes each data packet for signal strength and data quality (strength vs. noise). The higher your signal, the mare background noise you can sustain without causing degradation in the data transfer. This is also true for lower signal strengths with a very low background noise. These values are provided for guidance and if you have any questions about the values in your application, please contact ESTeem Customer Support at 509-735-9092 or e-mail your application to support@esteem.com.*

Modem ID – This is Modem ID for the opposite repeater peer.

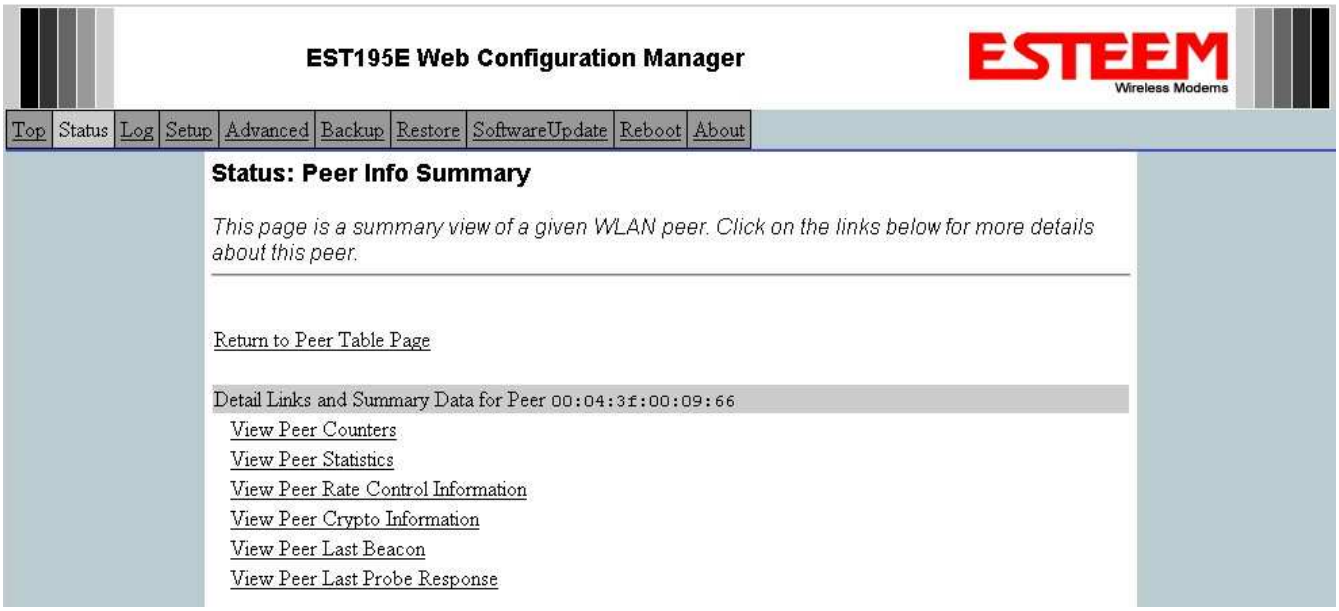


Figure 3: Peer Summary Table

Viewing RF Data Rates

The value shown on the Peer Status Screen for data rate may not be the actual rate of the RF link. To view the link information, click on the Opposite Modems WLAN MAC address in the Repeater Peer list (Figure 2) and further link status information will be displayed (Figure 3).

Once loaded, click on View Peer Rate Control Information. (Figure 4)

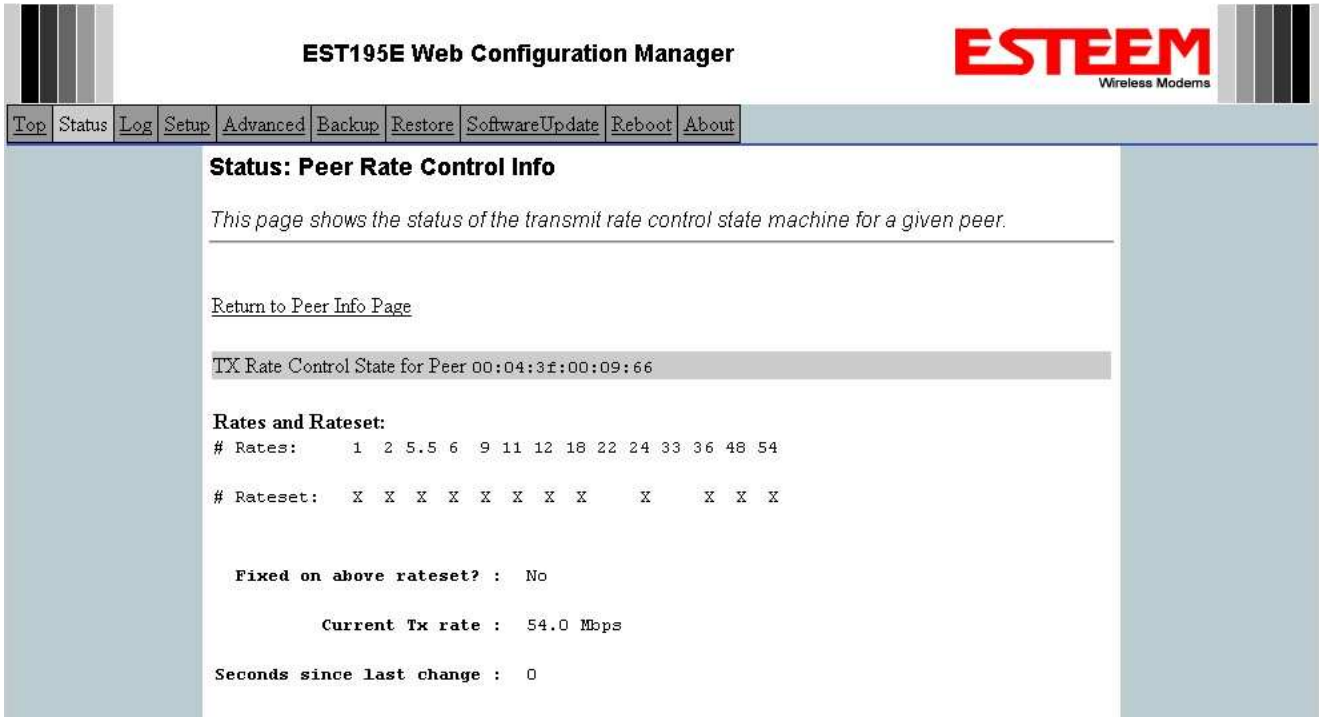

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Status: Peer Rate Control Info
This page shows the status of the transmit rate control state machine for a given peer.
Return to Peer Info Page
TX Rate Control State for Peer 00:04:3f:00:09:66
Rates and Rateset:
Rates: 1 2 5.5 6 9 11 12 18 22 24 33 36 48 54
Rateset: X X X X X X X X X X X X
Fixed on above rateset? : No
Current Tx rate : 54.0 Mbps
Seconds since last change : 0

Figure 4: Rate Control Information

The value of the Current TX rate is the RF data rate between the two ESTeem Model 195Eg.

SIGNAL STRENGTH VS DATA RATE

The following chart will show the average signal strength required to maintain a data rate. Please note that the data rates listed here can be greatly effected by overall activity on the radio channel and the total background noise. This values should be used as a guide, but testing after installation is required.

Receive Signal Strength	RF Data Rate
-89 dBm	1 Mbps
-86 dBm	2 Mbps
-85 dBm	5.5 Mbps
-88 dBm	6 Mbps
-87 dBm	9 Mbps
-82 dBm	11 Mbps
-84 dBm	12 Mbps
-82 dBm	18 Mbps
-79 dBm	24 Mbps
-75 dBm	36 Mbps
-70 dBm	48 Mbps
-68 dBm	54 Mbps

***Note**: The signal strength required for the above data rates are effected by other RF transmitters in the area. A higher signal strength will be required in applications with high background noise.*

UPDATING MODEL 192E TO OPERATE WITH 195EG

The ESTeem Model 192E can be used in a Model 195Eg system but does require an update to the firmware. Once the 192E firmware has been updated, all the programming instructions in this User's Manual will be applicable. The following firmware update procedure requires the **ESTeem 192E to first be updated to firmware version 220.19**. Once this has been verified, please proceed.

Local FTP Server

1. Configure an FTP server on the network where the ESTeem Model 192E is connected. Verify that you have anonymous access to the FTP server before proceeding.

2. Download the following files from the ESTeem FTP Site (ftp://www.esteem.com/192E).

   a. 192eupdate.sh
   b. 192epdrs.sh
   c. swupdate-192e-230.dev.65.img
   d. DOS2UNIX.EXE

3. Open the **192eupdate.sh** file using ***Wordpad***. Replace <server-IP> with the IP of your ftp server. Replace <version> with the firmware version (e.g., 230.dev). For example:

```
mkdir /var/update
cd /etc
wget ftp://172.16.252.251/ swupdate-192e-230.dev.65.img
dd if= swupdate-192e-230.dev.65.img of=/dev/ram0
mount /dev/ram0 /var/update
cd /var/update
/sbin/dkflash -v -d -w -o 0x00040000 kernel.img
/sbin/dkflash -v -d -w -o 0x00140000 rootfs.img
/sbin/reboot
```

4. Save the amended script file.
5. Open a ***Command Prompt***.
   a. Open the directory where the files have been saved and type the following:

   C:\<directory>dos2unix.exe 192eupdate.sh

   You will then see the following string:
   Dos2Unix: Processing file 192eupdate.sh…

Example:

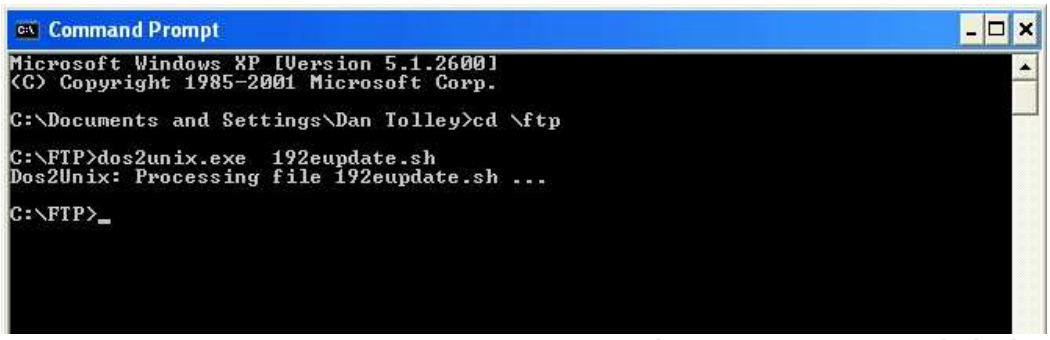


Figure 5: DOS Command Display

6. Using an Internet Explorer or other web browser, open the internal WebPage of the local ESTeem192E you wish to upgrade. A hardwired Ethernet connection to the modem is required.

7. Configure the 192E in the **Ethernet Only** mode, make changes permanent and reboot.

8. Choose **Run Script**

9. When prompted for the script URL input the following command string and submit:

ftp://<IP Address of FTP Server>/192epdrs.sh>

Example: ftp:// 172.16.1.1/192epdrs.sh

10. The modem will download and execute the firmware update. After the log file is displayed, configure the 192E in the **Access Point** mode, make changes permanent and reboot.

11. Choose **Run Script**

12. When prompted for the script URL input the following command string and submit:

ftp://<IP Address of FTP Server>/192eupdate.sh>

Example: ftp:// 172.16.1.1/192eupdate.sh

13. While the script is running, the 192E will not respond and the browser will time out. **Close** the browser window to refresh the path the 192E.

14. Please wait approximately 5 minutes before opening a new Internet Explorer browser to access the internal WebPages. Enter the IP address of the local ESTeem 192E to access the updated unit. The ESTeem 192E can now be reconfigured for use. Please refer to the **ESTeem 195Eg** Owner's Manual for details. If you do not have one, please download from the ESTeem FTP site at the following:

ftp://ftp.esteem.com/195Eg/AA107G Manual 195Eg.

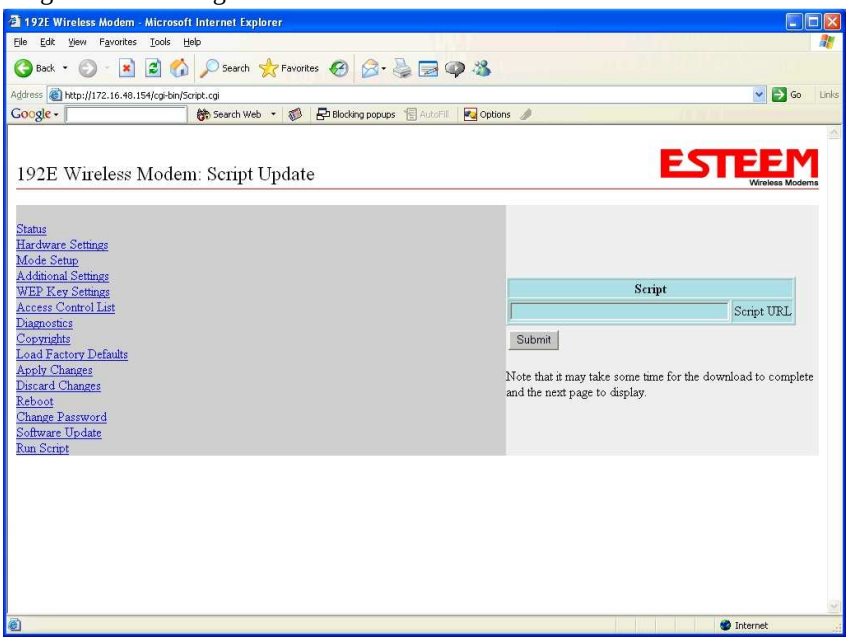


Figure 6: Script Input

LONG RANGE POINT TO POINT APPLICATIONS

The factory configuration on the 195Eg is optimized for distances up to 10 miles. If your application has an RF link with a range greater than 10 miles, you will need to set the maximum range value on both ESTeem 195Eg's on this communication link. To access the Maximum Distance value select **Advanced** from the top Menu then **Wireless LAN Settings>wlan0 device** and press the **Next** button (Figure 7).

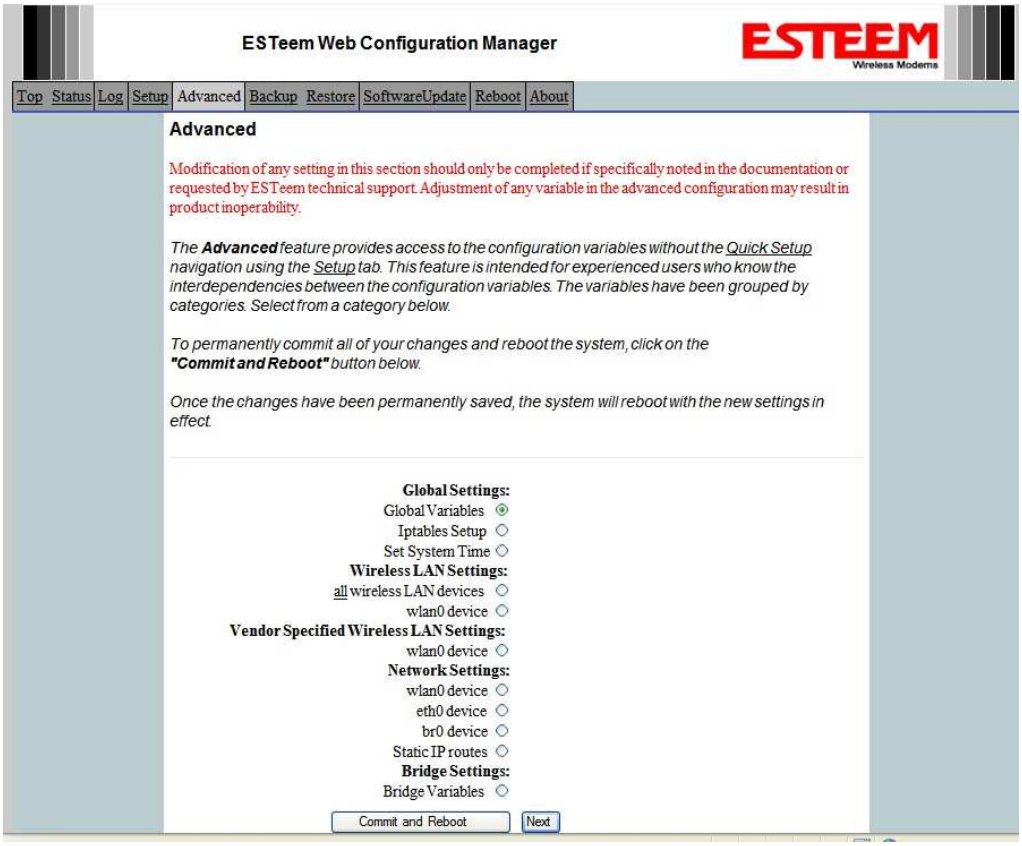

ESTeem Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 7: Advanced Features Screen

Scroll down the menu list until you find the Maximum Distance variable (Figure 8). Enter the maximum distance of the connection in miles. At the bottom of the screen press **Return to Advanced** button and then **Commit and Reboot** button (Figure 7) to save the information.

Figure 8: Maximum Distance Value Entry

TROUBLESHOOTING TIPS

General (Applicable to All Modes of Operation)

Where do I find the latest firmware version number? – We have the latest version number of the Model 195Eg firmware listed on the ESTeem Web site (www.esteem.com) under the Model 195Eg product page.

How and when do I update the Model 195Eg firmware? - You should only update the Model 195Eg firmware if you are having a specific problem and it is recommended that you do so by ESTeem Customer Support personnel. All the update instructions and files are located on the ESTeem FTP site at the following address:
ftp://www.esteem.com/195EG

Do all firmware versions have to be the same to communicate between the Model 195Eg? – It is not necessary for all the firmware versions to be the same revision to communication, but the later version may have added features that the other versions will not recognize.

What characters are valid for WEP Key entry? - Only the Hexadecimal characters 0-9 and A-F are valid for key entry.

What ESTeem Utility version is required to program the Model 195Eg? – The ESTeem Utility program is not required to program the Model 195Eg. The 195Eg can be programmed using any Terminal Emulation program (such as Windows HyperTerminal) and any web browser program.

What is the speed and duplex configuration on the Model 195Eg – The Model 195Eg is an auto-negotiation full/half-duplex 10/100 Base-T interface. Ether a cross-over or patch cable is supported.

Access Point Mode

Wireless LAN cards are not connecting – Verify that the wireless LAN cards are set to Infrastructure Mode, have a matching SSID (or ESSIS) set the same as the Model 195Eg and that all encryption codes are the same.

My Wireless LAN card shows a solid connection, but I can not pass any data – Verify the encryption and the ACL setting on the Model 195Eg match the wireless LAN card.

Access Point Repeater Mode

How long does it take to re-establish the Wireless Ethernet Network? - If a communication link is lost and the Wireless Network needs to re-establish the repeater routes, the time can take up to 30 seconds.

Should the AP Repeater Mode be used on mobile equipment? - The AP Repeater mode should be used on equipment that will not change the Repeater Route as it moves. For example, if a mobile device such as a crane can communicate directly to another ESTeem and will not loose the link in its travel, the AP Repeater Mode could be used. If the device requires two ESTeem Model 195Eg's (Base and Repeater) to maintain communication across its complete travel, the Station Modes should be used on the mobile device. The problem will be in the time that the mobile ESTeem will take to transfer between the two sites. In Access Point Repeater mode the transfer can take up to 30 seconds, while the EtherStation mode will transfer without a packet loss.

Does WEP have to be used? – The WEP does not have to be enabled for the modems to communicate, but all modems must be configured the same way.

Correct configuration, but cannot establish communications. – In addition to the network configuration, all 195Eg modems configured in the AP mode must share the same SSID and be on the same frequency channel. The most likely cause of the error is the WLAN MAC address is not configured in **both** 195Eg's repeater tables. If only one side is configured, everything will appear to be correct but no communication will function.

EtherStation

How do I access the Model 195Eg web page in EtherStation Mode? The Model 195Eg does not have an active web browser when configured in EtherStation mode. You must access the ESTeem with the ESTeem Discovery Program or through the RS-232 port after configuration in this mode. To monitor the link status, you can use the EtherStation Status program.

What IP address do I configure the ESTeem in EtherStation mode? – The Model 192E will not have an IP address in EtherStation mode.

I can not link my device into the wireless network – Verify that the MAC address of the device is **exactly** the same as configured in the Model 195Eg. The MAC address must have colons between the values.

Can I connect my Model 195Eg in EtherStation mode to a HUB or Ethernet Switch? – No. The modem must be connected directly to the Ethernet device for which it is programmed. In EtherStation mode the Model 195Eg can only service ONE Ethernet device.

TROUBLESHOOTING TIPS

General (Applicable to All Modes of Operation)

Where do I find the latest firmware version number? – We have the latest version number of the Model 195Eg firmware listed on the ESTeem Web site (www.esteem.com) under the Model 195Eg product page.

How and when do I update the Model 195Eg firmware? - You should only update the Model 195Eg firmware if you are having a specific problem and it is recommended that you do so by ESTeem Customer Support personnel. All the update instructions and files are located on the ESTeem FTP site at the following address:
ftp://www.esteem.com/195EG

Do all firmware versions have to be the same to communicate between the Model 195Eg? – It is not necessary for all the firmware versions to be the same revision to communication, but the later version may have added features that the other versions will not recognize.

What characters are valid for WEP Key entry? - Only the Hexadecimal characters 0-9 and A-F are valid for key entry.

What ESTeem Utility version is required to program the Model 195Eg? – The ESTeem Utility program is not required to program the Model 195Eg. The 195Eg can be programmed using any Terminal Emulation program (such as Windows HyperTerminal) and any web browser program.

What is the speed and duplex configuration on the Model 195Eg – The Model 195Eg is an auto-negotiation full/half-duplex 10/100 Base-T interface. Ether a cross-over or patch cable is supported.

Access Point Mode

Wireless LAN cards are not connecting – Verify that the wireless LAN cards are set to Infrastructure Mode, have a matching SSID (or ESSIS) set the same as the Model 195Eg and that all encryption codes are the same.

My Wireless LAN card shows a solid connection, but I can not pass any data – Verify the encryption and the ACL setting on the Model 195Eg match the wireless LAN card.

Access Point Repeater Mode

How long does it take to re-establish the Wireless Ethernet Network? - If a communication link is lost and the Wireless Network needs to re-establish the repeater routes, the time can take up to 30 seconds.

Should the AP Repeater Mode be used on mobile equipment? - The AP Repeater mode should be used on equipment that will not change the Repeater Route as it moves. For example, if a mobile device such as a crane can communicate directly to another ESTeem and will not loose the link in its travel, the AP Repeater Mode could be used. If the device requires two ESTeem Model 195Eg's (Base and Repeater) to maintain communication across its complete travel, the Station Modes should be used on the mobile device. The problem will be in the time that the mobile ESTeem will take to transfer between the two sites. In Access Point Repeater mode the transfer can take up to 30 seconds, while the EtherStation mode will transfer without a packet loss.

Does WEP have to be used? – The WEP does not have to be enabled for the modems to communicate, but all modems must be configured the same way.

Correct configuration, but cannot establish communications. – In addition to the network configuration, all 195Eg modems configured in the AP mode must share the same SSID and be on the same frequency channel. The most likely cause of the error

is the WLAN MAC address is not configured in **both** 195Eg's repeater tables. If only one side is configured, everything will appear to be correct but no communication will function.

EtherStation

How do I access the Model 195Eg web page in EtherStation Mode? The Model 195Eg does not have an active web browser when configured in EtherStation mode. You must access the ESTeem with the ESTeem Discovery Program or through the RS-232 port after configuration in this mode. To monitor the link status, you can use the EtherStation Status program.

What IP address do I configure the ESTeem in EtherStation mode? – The Model 192E will not have an IP address in EtherStation mode.

I can not link my device into the wireless network – Verify that the MAC address of the device is **exactly** the same as configured in the Model 195Eg. The MAC address must have colons between the values.

Can I connect my Model 195Eg in EtherStation mode to a HUB or Ethernet Switch? – No. The modem must be connected directly to the Ethernet device for which it is programmed. In EtherStation mode the Model 195Eg can only service ONE Ethernet device.

ESTEEM DISCOVERY UTILITY

The ESTeem Discovery Utility will allow you to configure the IP address on the Model 195Eg to match your network regardless of its current IP subnet. This utility will also allow you to update the software in the 195Eg and open the web configuration for that wireless modem.

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Service:
Español
Contact Us
Home
Wireless Solutions...Communications
Technical Support
ESTeem Utilities
Training
Technical Library
RF Design Program
ESTeem Home Page
ESTeem Wireless Modems manufacturers the complete line of ESTeem(TM) wireless products. The ESTeem Wireless Modems are available in High Speed Wireless Ethernet, Licensed Narrow Band Serial, and Unlicensed Spread Spectrum in the VHF and UHF radio communication bands.
The industry leader and patent holder on the wireless modem for over 20 years, EST has been providing the industrial control, public safety, and federal markets with proven and reliable wireless solutions. With our latest advancements to the ESTeem Wireless Ethernet line such as the Model 195Eg, the first 802.11g Wireless Ethernet radio built for the rigors of industrial use, we will again set the standard in the wireless industry!
News
Rockwell Automation
AUTOMATION FAIR
ESTeem Wireless Modems Debuts Latest Industrial Wireless Products >>
November 14, 2007
Automation Fair 2007, Chicago, IL — November 14, 2007 — Electronic Systems Technology, Inc. (EST) (OTC: ELST), dba ESTeem Wireless Modems, the manufacturer of the ESTeem

Figure 1: ESTeem Resource Main Page

Installation

To install the Discovery Utility on your computer, inserting the Resource Disk in your CD drive.

Note: The ESTeem Resource Disk is stand-alone copy of the ESTeem Web site (Figure 1). Navigation of the Resource Disk is as simple as using your web browser. All technical documentation, User's Manuals and the ESTeem Utility Program is available on the disk.

1. Place the ESTeem Utility CD in your CD-ROM drive. The CD will auto load the ESTeem main page

Note: If the page does not auto load, open your web browser and set your address line to D:\index.html (Where D: is the drive letter for your CD-ROM drive).

2. From the Main Page select ESTeem Utilities and click on ESTeem Discovery Utility (Figure 2).

Note: This program is saved in a compressed file format. Microsoft Windows XP® will open the file directly, but other operating systems will require a common compression program such as WinZip available for download at http://www.winzip.com

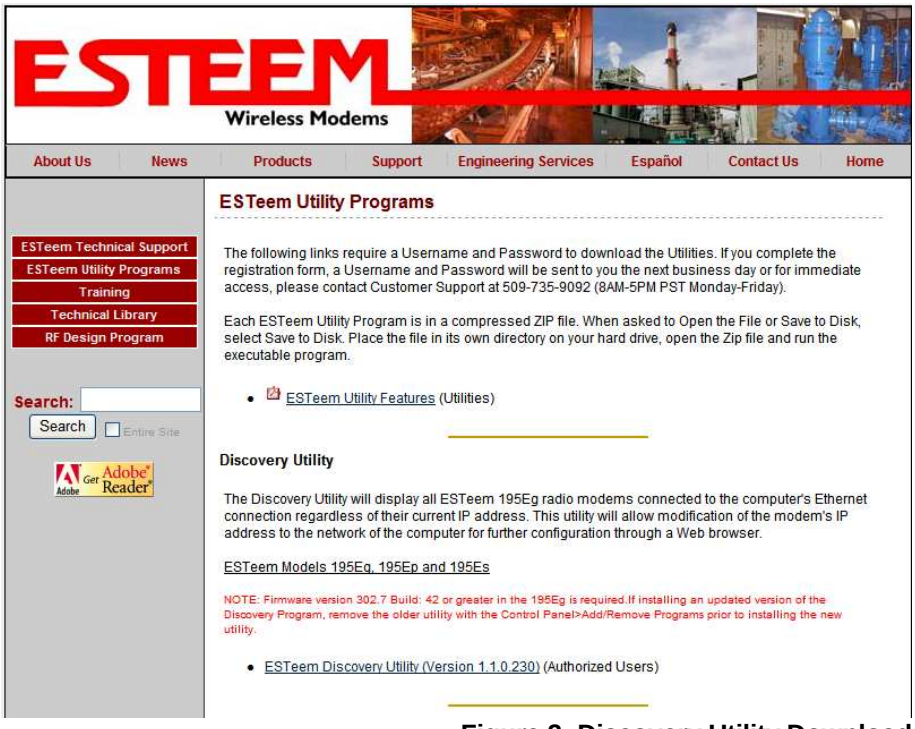

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Services
Español
Contact Us
Home
ESTeem Technical Support
ESTeem Utility Programs
Training
Technical Library
RF Design Program
Search:
Search
Entire Site
Get Adobe Reader
ESTeem Utility Programs
The following links require a Username and Password to download the Utilities. If you complete the registration form, a Username and Password will be sent to you the next business day or for immediate access, please contact Customer Support at 509-735-9092 (8AM-5PM PST Monday-Friday).
Each ESTeem Utility Program is in a compressed ZIP file. When asked to Open the File or Save to Disk, select Save to Disk. Place the file in its own directory on your hard drive, open the Zip file and run the executable program.
ESTeem Utility Features (Utilities)
Discovery Utility
The Discovery Utility will display all ESTeem 195Eg radio modems connected to the computer's Ethernet connection regardless of their current IP address. This utility will allow modification of the modem's IP address to the network of the computer for further configuration through a Web browser.
ESTeem Models 195Eg, 195Ep and 195Es
NOTE: Firmware version 302.7 Build: 42 or greater in the 195Eg is required.If installing an updated version of the Discovery Program, remove the older utility with the Control Panel>Add/Remove Programs prior to installing the new utility.
ESTeem Discovery Utility (Version 1.1.0.230) (Authorized Users)

Figure 2: Discovery Utility Download

3. Double click on the 195EgiscoverySetup.exe file listed in the window to install the program.

4. Connect the Model 195Eg to your computer either direct to the Ethernet card or through a HUB/Switch using a CAT-5e Ethernet cable. The Ethernet port on the 195Eg supports Auto-Negotiation so either a patch cable or crossover cable will work. Open the ESTeem Discovery Program and press the Discover Modems button. The Model 195Eg will be displayed in the program by the Ethernet MAC address and Current IP Address (Figure 3).

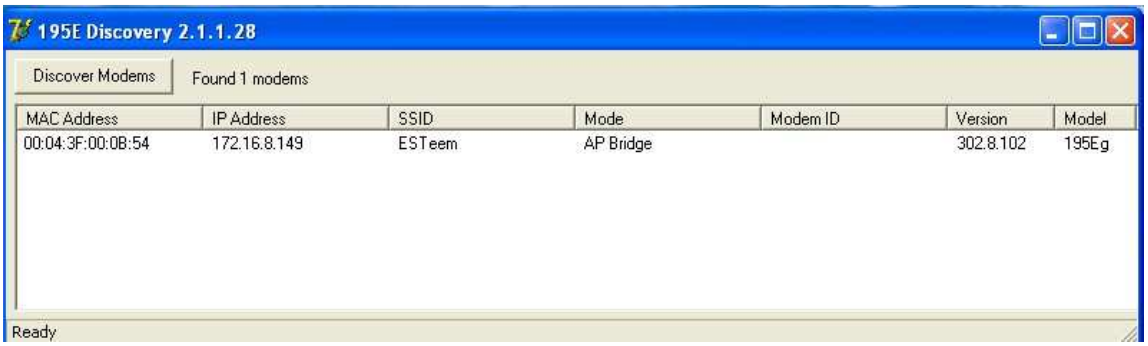


Figure 3: Discovery Program Main Page

Note: *The SSID, Mode of Operation and Modem ID will be adjusted through the web configuration manager..*

5. Double-click on the 195Eg you want to program and the *Configure IP Address* window will be displayed (Figure 4). Enter an IP address and Subnet Mask for the 195Eg that matches your network subnet and press the OK button to save this to the ESTeem. You will receive notification that the Configuration was Successful and the 195Eg will reboot. Proceed to ESTeem Setup in Chapter 4.

Figure 4: Change IP Address Window

Firmware Updates

To update firmware on any ESTeem Model 195 that is shown on the Discovery program, "right-mouse" click on the 195's MAC address and select **Update** from the menu (Figure 5)**.** Once you locate the update file, select the **Open** button and the 195 will update, validate and then reboot with the updated operating system.

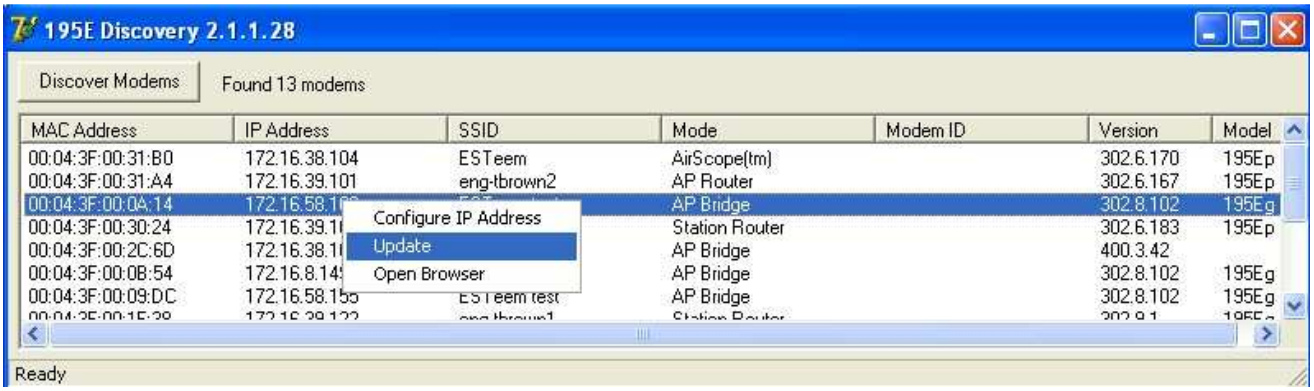


Figure 5: Discovery Features Menu

Opening Web Browser

To quickly open a web browser page to the IP address programmed in the 195 modem, "right-mouse" click on the 195's MAC address and select **Open Browser** from the menu (Figure 5)**.** If your computer is configured for the same IP subnet at the ESTeem 195 wireless modem, you will be asked to sign in with the Username and Password (Figure 6) and you can begin programming the Model 195 for your application.

Figure 6: ESTeem Web Page Log-on Screen

ETHERSTATION STATUS PROGRAM

When configured for EtherStation mode, the Web Configuration Manger is turned off. To gather information from the 195Eg on Access Point, link status and received signal strength you will need to install the ESTeem 195E Status Utility. The EtherStation Status Utility version 2.0.0.0 or greater provides a new feature where it will automatically program the connected ESTeem 195Eg to match up with the computer running the software. This software requires that the ESTeem 195Eg has software version 302.8.102 or greater installed for this feature to function.

This software program is found on the AA109 Resources Disk or available from the ESTeem web site. To install the utility, please complete the following:

Installation

The ESTeem Discovery Utility will allow you to configure the IP address on the Model 195Eg to match your network. Install the Discovery Utility on your computer by inserting the Resource Disk in your CD drive.

Note: The ESTeem Resource Disk is stand-alone copy of the ESTeem Web site (Figure 1). Navigation of the Resource Disk is as simple as using your web browser. All technical documentation, User's Manuals and the ESTeem Utility Program is available on the disk.

1. Place the ESTeem Utility CD in your CD-ROM drive. The CD will auto load the ESTeem main page

Note: If the page does not auto load, open your web browser and set your address line to D:\index.html (Where D: is the drive letter for your CD-ROM drive).

2. From the Main Page select ESTeem Utilities and click on EtherStation Status Utility

Note: This program is saved in a compressed file format. Microsoft Windows XP® will open the file directly, but other operating systems will require a common compression program such as WinZip available for download at http://www.winzip.com

3. Double click on the 195EStatusSetup.exe file listed in the window to install the program.

4. Connect the Model 195Eg to your computer either direct to the Ethernet card or through a HUB/Switch using a CAT-5e Ethernet cable. The Ethernet port on the 195Eg supports Auto-Negotiation so either a patch cable or crossover cable will work. Open the ESTeem Status Program and a status icons will appear in your system tray (Figure 9). When the status menu is opened from the system tray, the status window will be displayed (Figure 7) to show the Access Point MAC address and signal strength. The tray icon and Signal Strength bar will display the colors from Green, Yellow to Red on progressively poorer signal or will show Grey if roaming.

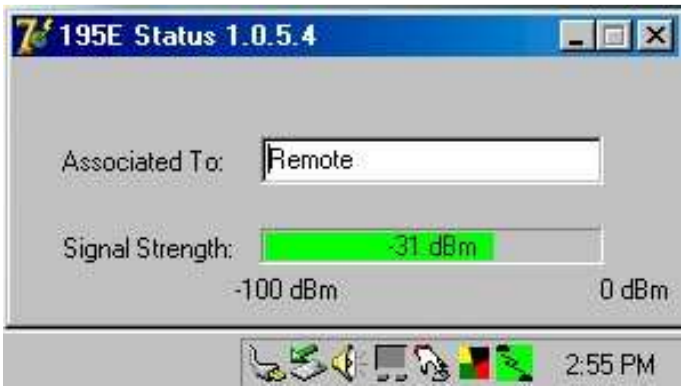


Figure 7: EtherStation Status Program

Note: *This Utility will only operate with an ESTeem Model 195Eg in EtherStation mode.*

SETTING LOCAL TIME

The ESTeem Model 195Eg will be shipped from the factory with the internal real-time clock set to Pacific Time. To change the clock settings to the local time for accurate log file entries:

1. Select **Advanced** from the top Menu then **Wireless LAN Settings>wlan0 device** and press the **Next** button (Figure 8).

2. Select **Global Settings>Set System Time** from the menu and press the **Next** button to continue.

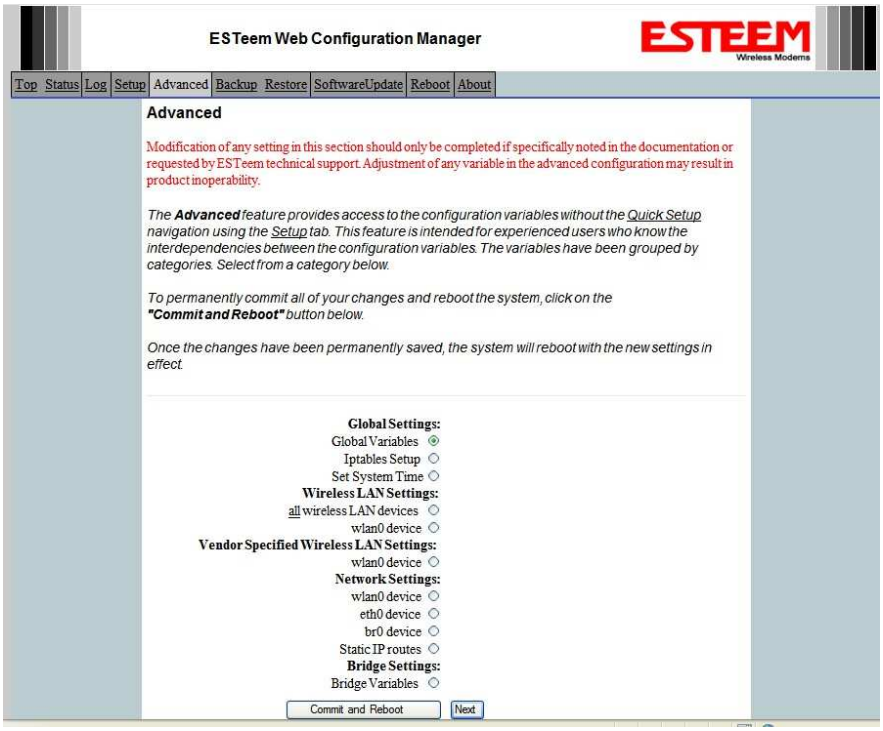

ESTeem Web Configuration Manager
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Iptables Setup
Set System Time
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 8: Advanced Features Screen

3. Select the correct date and time from the drop-down menus (Figure 9) and press the **Set System Time** button to save the time to the real time clock.

ESTeem Web Configuration Manager
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Advanced - Set System Time
This page allows you to set the system time in the modem.
Current System Time: Thu, 24 Jan 2008 13:55:32
Year 2008 Enter the four digit year.
Month 01 Select the month from the list
Day 24 Select the day from the list
Hour 13 Select the hour from the list
Minutes 55 Select the minutes from the list
Seconds 32 Select the seconds from the list
Set System Time
Return to Advanced

Figure 9: Advanced Features Screen

CONFIGURING TIME SERVER

Enabling NTP time synchronization services on the ESTeem 195Eg will allow to use time services from upstream services to keep the time on the system accurate.

To allow time synchronization, the Model 195Eg must be configured with the NTP Daemon enabled and the appropriate IP address of the upstream network NTP server.

1. Select **Advanced** from the menu items and **Global Variables** (Figure 10).

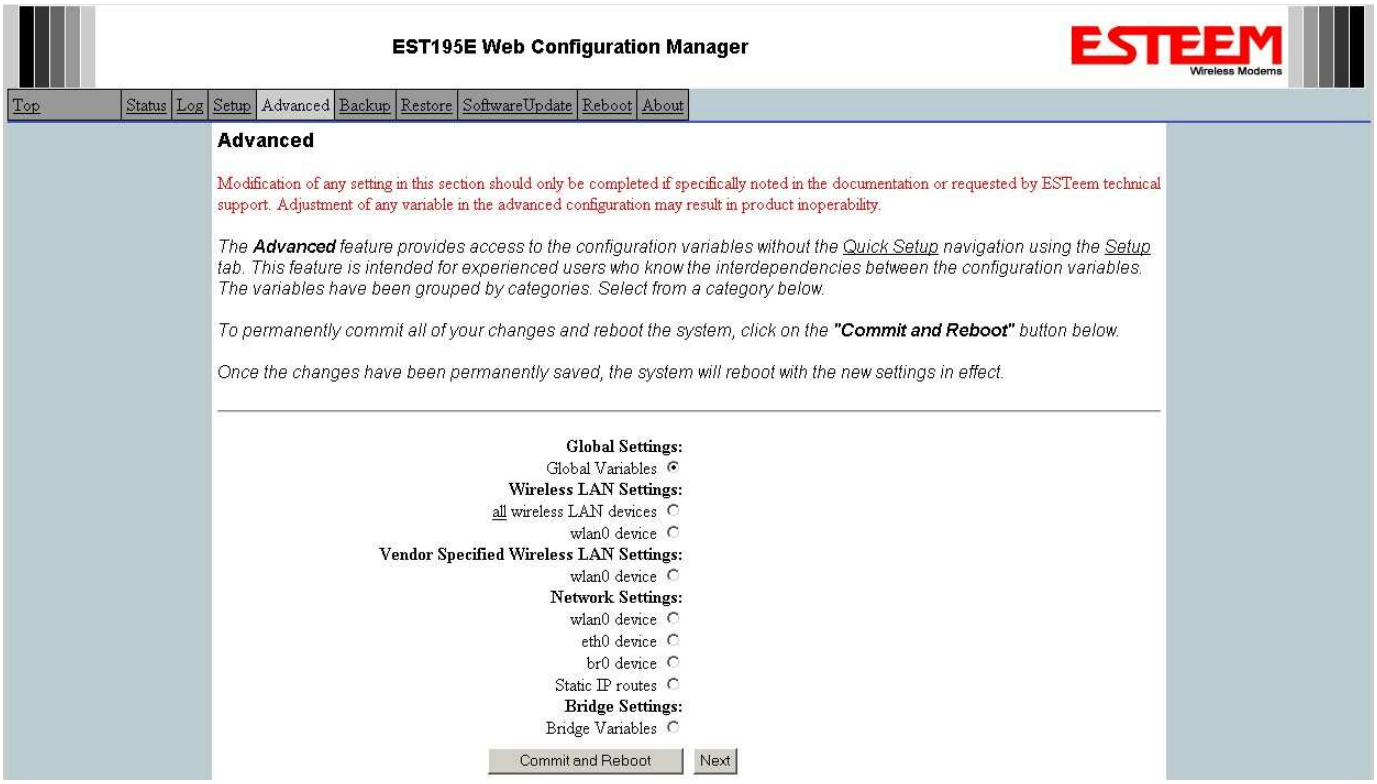

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 10: Advanced Settings Menu

2. Press the next button and Figure 11 will be displayed. At the bottom of the page are the NTP server configurations.

3. The NTP daemon is enabled by selecting YES for **NTP ENABLE** (Figure 11). When enabled, the NTP daemon will use time services from upstream services to keep the time on this system accurate.

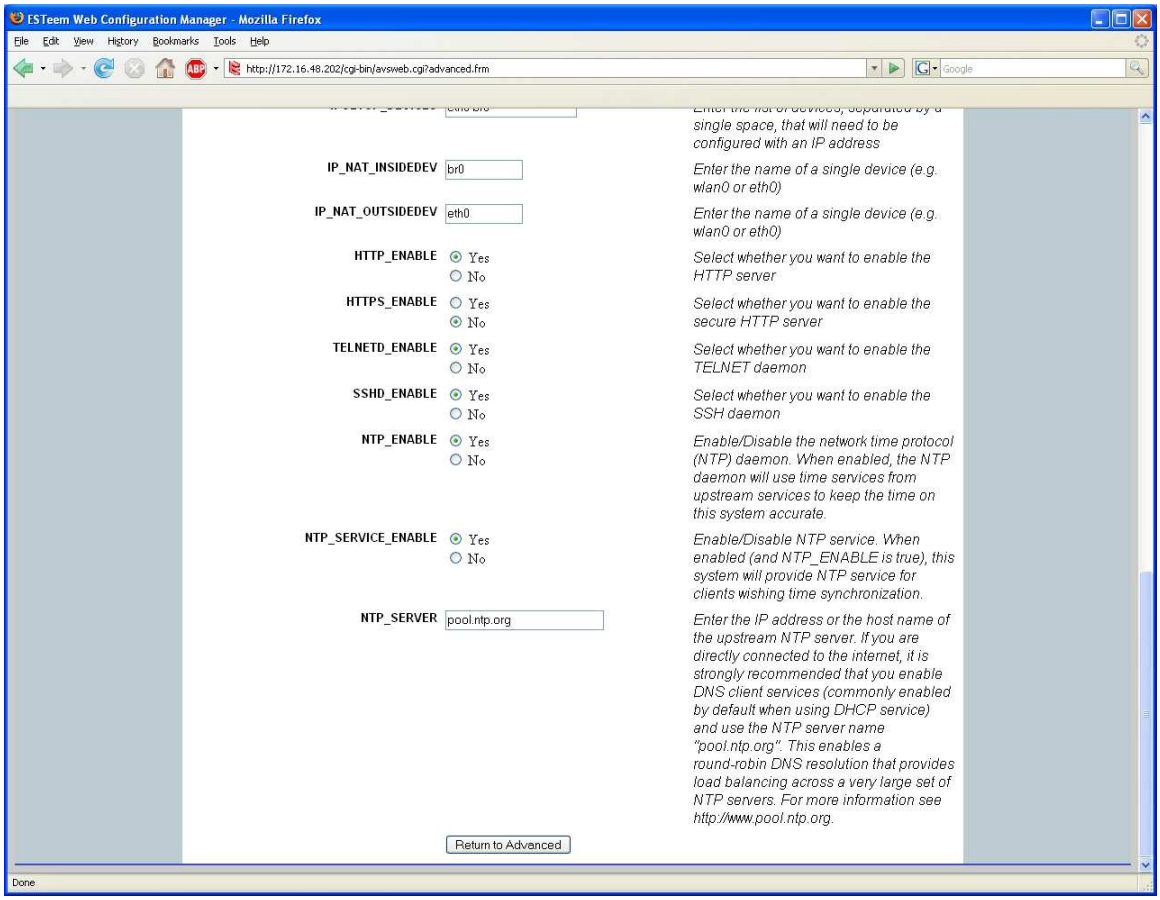

ESTeem Web Configuration Manager - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://172.16.48.202/cgi-bin/avsweb.cgi?advanced.frm
single space, that will need to be configured with an IP address
IP_NAT_INSIDEDEV
br0
Enter the name of a single device (e.g. wlan0 or eth0)
IP_NAT_OUTSIDEDEV
eth0
Enter the name of a single device (e.g. wlan0 or eth0)
HTTP_ENABLE
Yes
No
Select whether you want to enable the HTTP server
HTTPS_ENABLE
Yes
No
Select whether you want to enable the secure HTTP server
TELNETD_ENABLE
Yes
No
Select whether you want to enable the TELNET daemon
SSHD_ENABLE
Yes
No
Select whether you want to enable the SSH daemon
NTP_ENABLE
Yes
No
Enable/Disable the network time protocol (NTP) daemon. When enabled, the NTP daemon will use time services from upstream services to keep the time on this system accurate.
NTP_SERVICE_ENABLE
Yes
No
Enable/Disable NTP service. When enabled (and NTP_ENABLE is true), this system will provide NTP service for clients wishing time synchronization.
NTP_SERVER
pool.ntp.org
Enter the IP address or the host name of the upstream NTP server. If you are directly connected to the internet, it is strongly recommended that you enable DNS client services (commonly enabled by default when using DHCP service) and use the NTP server name "pool.ntp.org". This enables a round-robin DNS resolution that provides load balancing across a very large set of NTP servers. For more information see http://www.pool.ntp.org.
Return to Advanced
Done

Figure 11: NTP Settings

4. Next, the **NTP SERVICE ENABLE** should be configured to "YES," if you want to allow the system to provide NTP service for clients wishing time synchronization (Figure 11).

5. The final step in configuring NTP services is to enter the IP address or the host name of the upstream NTP server.

6. Once configuration is complete, press the “Return to Advanced” button.

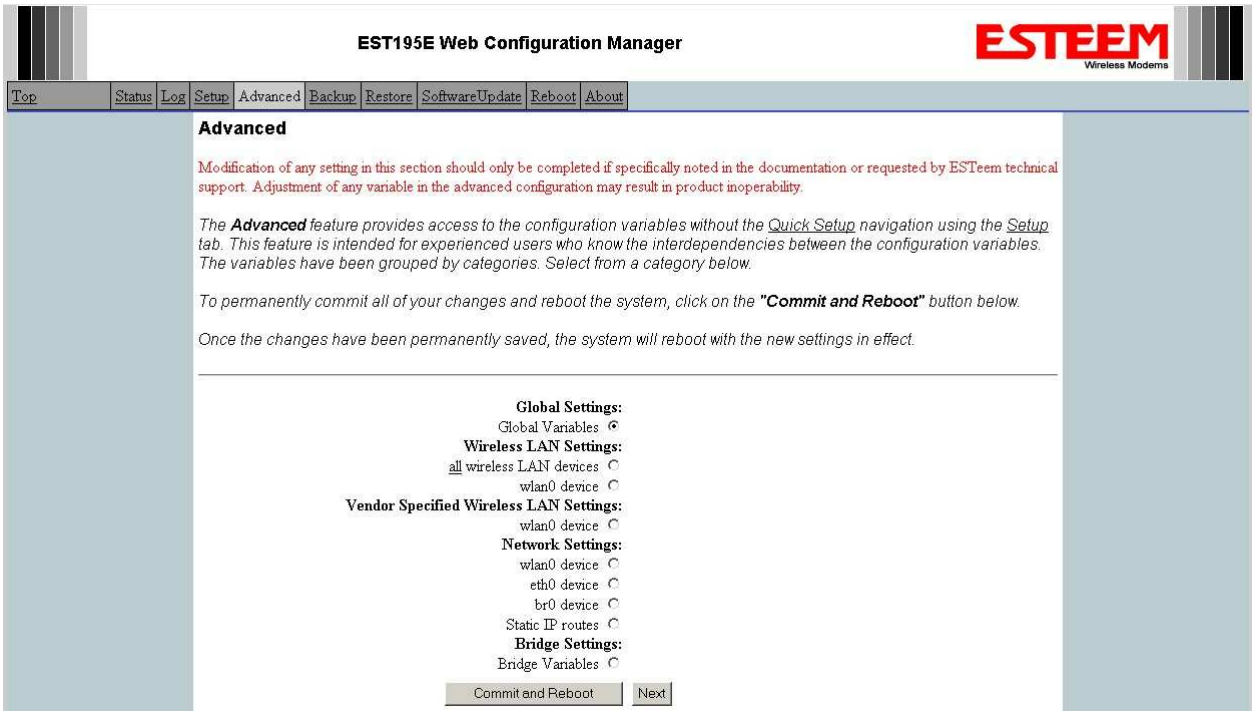

EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Advanced
Modification of any setting in this section should only be completed if specifically noted in the documentation or requested by ESTeem technical support. Adjustment of any variable in the advanced configuration may result in product inoperability.
The Advanced feature provides access to the configuration variables without the Quick Setup navigation using the Setup tab. This feature is intended for experienced users who know the interdependencies between the configuration variables. The variables have been grouped by categories. Select from a category below.
To permanently commit all of your changes and reboot the system, click on the "Commit and Reboot" button below.
Once the changes have been permanently saved, the system will reboot with the new settings in effect.
Global Settings:
Global Variables
Wireless LAN Settings:
all wireless LAN devices
wlan0 device
Vendor Specified Wireless LAN Settings:
wlan0 device
Network Settings:
wlan0 device
eth0 device
br0 device
Static IP routes
Bridge Settings:
Bridge Variables
Commit and Reboot
Next

Figure 12: Advanced Settings Menu

7. To complete the configuration, select “Commit and Reboot.” The ESTeem 195Eg will now commit the configuration changes and reboot. (Figure 12)

VLAN OPERATION

Virtual LAN (VLAN) systems are rapidly becoming the desired configuration on larger Ethernet networks. The ESTeem 195Ed software will allow the Ethernet modems to transparently pass the VLAN packets for these networks. The 195Ed currently can not be used as a VLAN switch, but will pass VLAN tagged Ethernet packets through the wireless bridge.

IGMP SNOOPING

Internet Group Management Protocol (IGMP) Snooping allows the ESTeem 195Eg to operate more efficiently in networks with high Multicast (UDP, etc.) traffic. IGMP Snooping will define the destination for the Multicast traffic and send the data to the correct wireless Ethernet modem and not the entire network. This limiting of Multicast traffic to specific destinations greatly increases the overall network efficiency.

There are two types of Ethernet packets on a network, unicast and multicast. Unicast is intended for exactly one recipient (and ignored by all others) and multicast is intended to be received by multiple recipients. In a unicast network, all Ethernet traffic is Acknowledged and guaranteed to get to a destination. The problem with using Multicast traffic over a wireless connection is that Multicast packets do not require an Acknowledge on the protocol layer. If the wireless network misses a data packet on the RF network, that Multicast data packet is lost.

Theory of Operation

There are two types of Ethernet packets on a network, unicast and multicast. Unicast is intended for exactly one recipient (and ignored by all others) and multicast is intended to be received by multiple recipients. Interested parties can listen for particular multicast packets, but most nodes ignore it. In any case, the network medium is still utilized no matter how many nodes are listening. Broadcast packets are a special type of multicast traffic which all nodes always receive. These are of particularly useful for global announcements (Hey, I'm Alice!) and queries (Hey, I'm Alice and I'm looking for Bob!). More relevantly, it is how hosts on a network find out each other's addresses, and are absolutely crucial to the proper functioning of a network.

As the network grows physically, it encounters some growing pains. The first is more physical, relating to the cabling limitations. Bridges solve this problem by joining two physical networks together so they appear to be a single large network. Through use of bridges, a network can scale to hundreds or even thousands of hosts. There is a downside, however. Well before the physical limitations of bridging hit, you start to run into efficiency problems, as all traffic has to travel everywhere on the network. The raw carrying capacity of this shared medium, often referred to as bandwidth, is the second scaling problem.

Smart bridges, or switches, help alleviate the bandwidth problem by only passing traffic across the bridge if the destination host was on the other side. This greatly increases the capacity and efficiency of the network by allowing two pairs of hosts communicating simultaneously on each side of the switched bridge. Only when the packet needs to go to the other side is both mediums utilized simultaneously for the same packet.

Unfortunately, broadcast and multicast traffic by its very nature has to be always relayed across the bridge. While the number of network nodes may grow linearly, the multicast traffic tends to grow exponentially. This isn't generally a problem for wired networks, as they have a considerable amount of bandwidth to spare, but wireless networks have at best an order of magnitude less bandwidth to begin with. If a wireless network is bridged with a wired network, while the absolute numbers are the same, a much higher proportion of the wireless networks' available bandwidth is used up by multicast traffic. This effect is further magnified if multiple wireless repeaters are in use.

The preferred way of dealing with excess multicast traffic is to put the wireless network on a different sub-network (subnet) and use a router to join it to the wired network. This ensures that only unicast traffic intended for the wireless network crosses over, as multicast and broadcast traffic stays within its local subnet. Normally this is fine, but there are times where you need multicast traffic to span subnets. For IP traffic, this can be obviated by using a multicast-capable router, but for legacy multicast protocols that were not designed to be routed, another solution must be found.

There are two primary types of communication networks used in wireless Ethernet systems; fixed points communicating to each other through an Ethernet Bridge and mobile devices communicating to these fixed points. The fixed point Ethernet bridge communication in the 195Eg is through Repeater Peer links, while the mobile communication is from the Client modes (EtherStation, Station Router and Station Masquerade) to the Access Points (Fixed Locations) in the network. Each of these networks handles Multicast traffic differently as explained below.

Ethernet Bridge Mode (Repeater Peers)

When the ESTeem 195Eg is configured as a repeater peer, all multicast traffic is "wrapped" in a Unicast frame and sent to all other repeater peers. (Figure 13) This operation allows the ESTeem network to receive an acknowledge packet and retransmit the data if the packet is lost during transmission. This unicast encapsulation will work regardless is the protocol can support IGMP or not.

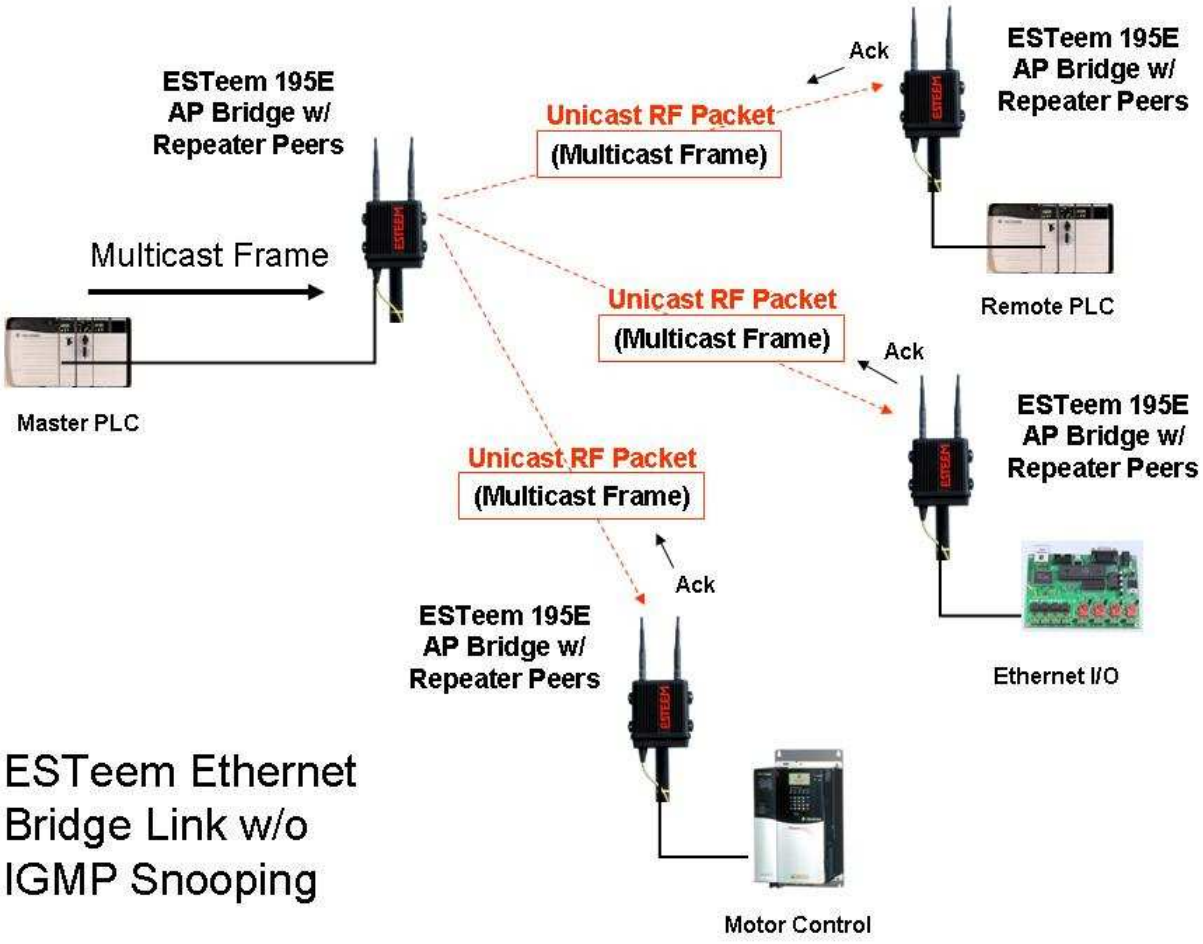


Figure 13: Repeater Peer Operation

Ethernet Bridge Mode (Repeater Peers) With IGMP Snooping

When the ESTeem 195Eg is configured as a repeater peer, IGMP Snooping is enabled and the network supports IGMP protocol, the 195Eg will begin to identify the connected Ethernet devices using Multicast transmissions and report this information to the network. As this process continues, all sites that have Multicast traffic on the wireless network will only send these requests to the specific ESTeem reporting the Ethernet device (see Figure 14).

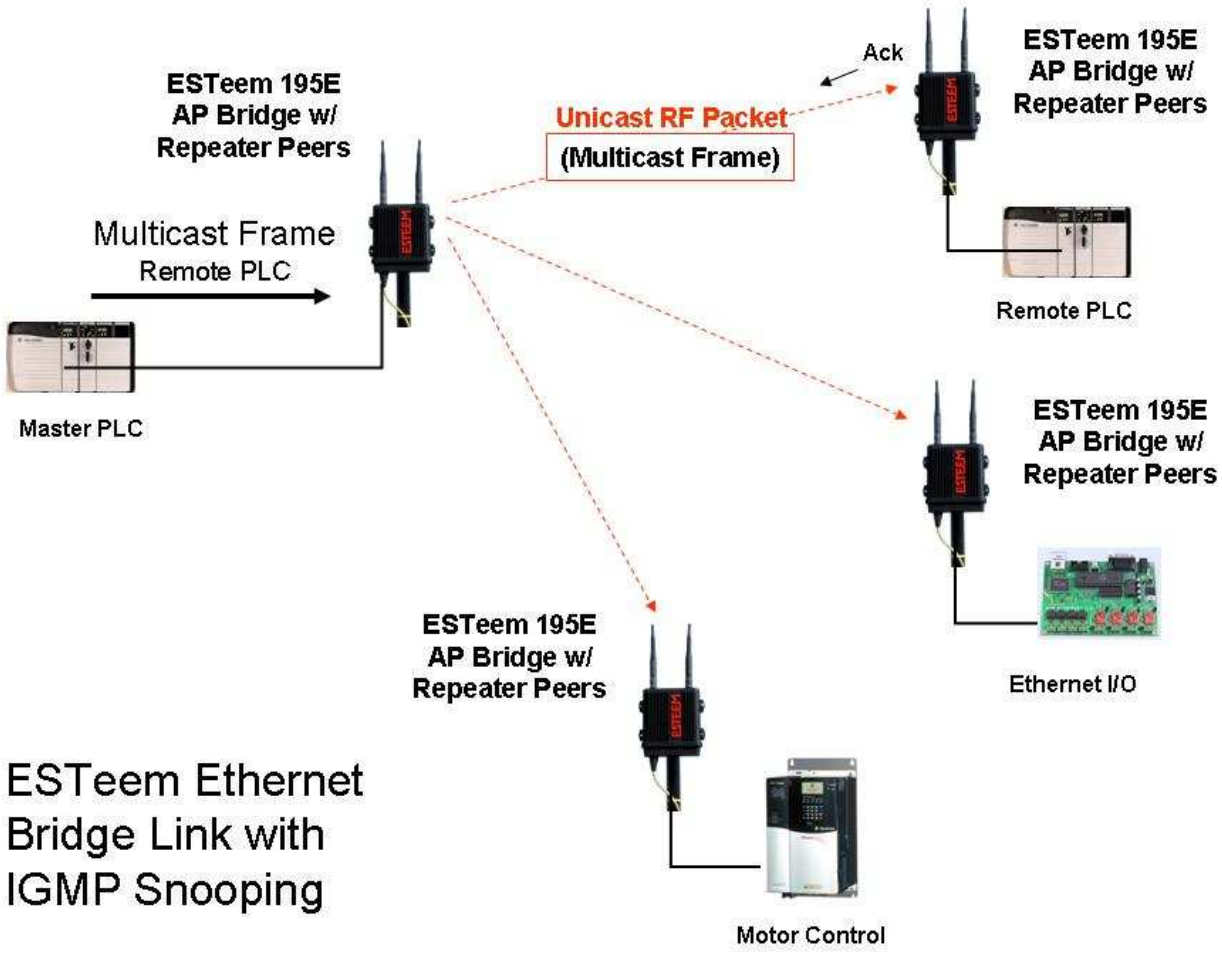
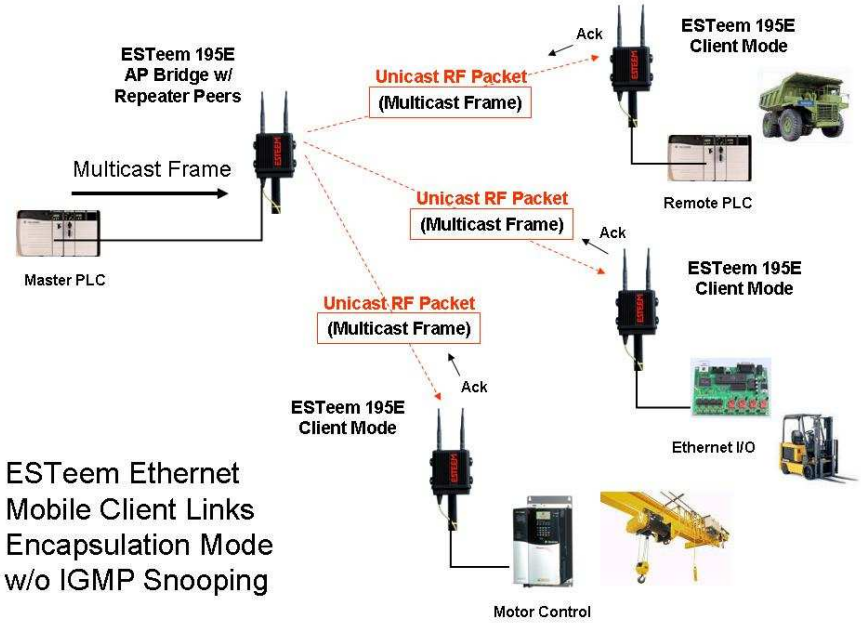


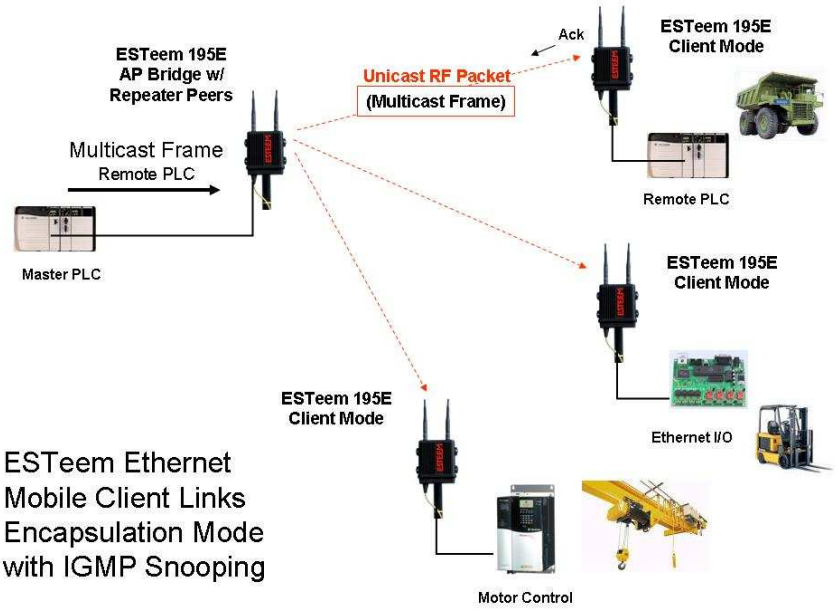
Figure 14: Repeater Peer with IGMP Enabled

Client Modes

When the ESTeem 195Eg is configured as a mobile client (EtherStation, Station Router or Station Masquerade), there are two configurations that will increase the reliability of Multicast traffic. The first phase is encapsulation of the multicast packets, as described in the Repeater Peer, and the second is IGMP Snooping if the network will support the protocol. The encapsulation of the Multicast packets will operate regardless of the IGMP support to increase the reliability.



ESTeem Ethernet Mobile Client Links Encapsulation Mode w/o IGMP Snooping



ESTeem Ethernet Mobile Client Links Encapsulation Mode with IGMP Snooping

Multicast Encapsulation

To enable Multicast Encapsulation, select **Advanced>Wireless LAN Settings>wlan0 device** and press the *Next* Button (Figure 15). Select wlan0_EncapsulateMulitcast to either Multicast (for all Multicast including Broadcast) or Broadcast (Broadcast only), press the *Accept* Button and then *Commit and Reboot*.

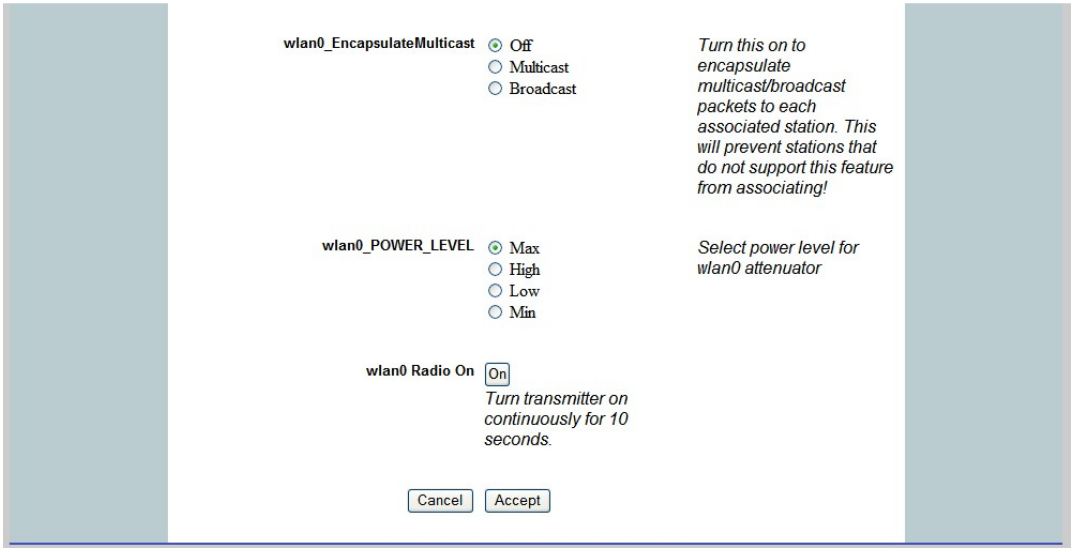


Figure 15: Multicast Enable

Enabling IGMP Snooping

To enable the ESTeem 195Eg for IGMP Snooping, select **Advanced>Bridge Variables** and press the *Next* Button (Figure 16). Select IGMP Snoop to YES, press the *Accept* Button and then *Commit and Reboot*.

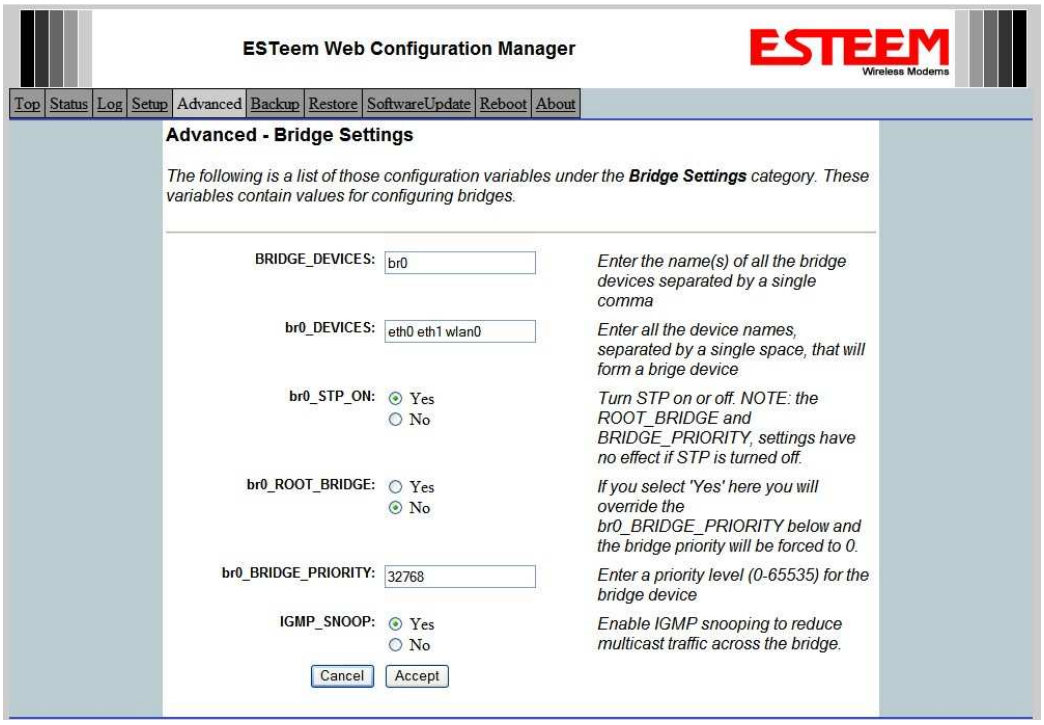


Figure 16: Repeater Peer with IGMP Enabled

Simple Network Management Protocol (SNMP)

The ESTeem 195Eg supports SNMP Version 1 (SNMPv1) and Version 2 (SNMPv2c) protocol. This protocol enables any SNMP server to view the status of the wireless network while the system is in operation. The following are a list of the Management Information Base (MIB) items that are supported in the ESTeem 195Eg and their MIB location:

MIB Name	MIB Directory Location	Notes
System Temperature	EST-MIB::sysInternalTemp.0	in C * 1000
Uptime	HOST-RESOURCES-MIB::hrSystemUptime.0	System Update
ModemID	EST-MIB::sysIdentifier.0	User-specified “nickname” for ESTeem
Serial Number	EST-MIB::sysSerialNumber.0	ESTeem serial number
Model	EST-MIB::sysModel.0	ESTeem model number
Firmware Version	EST-MIB::sysFirmwareRevision.0	Firmware revision
System Mode	EST-MIB::sysMode.0	AP_BRIDGE/STA_ETHERSTA, etc
Free Memory	UCD-SNMP-MIB::memTotalFree.0	Total Free Memory
Idle CPU	UCD-SNMP-MIB::ssCpuIdle.0	Percentage of CPU Idle
[[per-interface]]		
IP Address	IF-MIB::ifAddress	
Port Speed	IF-MIB::ifSpeed	In bps
Port Status	IF-MIB::ifOperStatus	
Mac Address	IF-MIB::ifPhysAddress	
[[per-wlandev entry]]	**EST-MIB::wirelessDevicesNumber.0**	**Wireless Port Identification**
Device Name	EST-MIB::wirelessDeviceTable.1.wName.1	Name of device (wlan0 standard)
MAC Address	EST-MIB::wirelessDeviceTable.1.wMacAddress.1	MAC address of WLAN port
Mode	EST-MIB::wirelessDeviceTable.1.wMode.1	Current Mode ap=access point, sta=station mode and airscope
Frequency	EST-MIB::wirelessDeviceTable.1.wFreq.1	Frequency in MHz
Bandwidth	EST-MIB::wirelessDeviceTable.1.wBandwidth.1	Bandwidth (5, 10, or 20 MHz if used)
SSID	EST-MIB::wirelessDeviceTable.1.wSSID.1	Service Set Identification
BSSID	EST-MIB::wirelessDeviceTable.1.wBSSID.1	Basic Service Set Identification
Operational Rates	EST-MIB::wirelessDeviceTable.1.wOpRates.1	List of RF Data Rates in Rate Set
Basic Rates	EST-MIB::wirelessDeviceTable.1.wBasRates.1	List of RF Basic Rates for status messages

[[peer table entry]]		**All entries in the Peer Table will have a device entry index, both ESTeem and other wireless devices**
	EST-MIB::wirelessPeersNumber.0	Total number of peer entries in table
wlan device	EST-MIB::wirelessPeerTable.1.pDevice.1	index into the wirelessDeviceTable (each entry will have a unique number
Peer MAC Address	EST-MIB::wirelessPeerTable.1.pMacAddr.1	MAC address of peer
isRepeater?	EST-MIB::wirelessPeerTable.1.pRepeater.1	Is the peer an ESTeem repeater
isAP?	EST-MIB::wirelessPeerTable.1.pAP.1	Is the peer an Access Point
isAssocSta?	EST-MIB::wirelessPeerTable.1.pAssoc.1	Is the peer an Mobile Client
isAdhoc?	EST-MIB::wirelessPeerTable.1.pAdhoc.1	Is the peer an AdHoc Station (802.11 only)
Frequency	EST-MIB::wirelessPeerTable.1.pFreq.1	Frequency in MHz
current rate set	EST-MIB::wirelessPeerTable.1.pCurRates.1	Current Operating Rates
last rx signal	EST-MIB::wirelessPeerTable.1.pSignal.1	Receive Signal in –dBm
last rx noise	EST-MIB::wirelessPeerTable.1.pNoise.1	Background Noise in –dBm
BSSID	EST-MIB::wirelessPeerTable.1.pBssid.1	Basic Service Set ID (In Hex)
SSID	EST-MIB::wirelessPeerTable.1.pSSID.1	SSID in Text
isValid?	EST-MIB::wirelessPeerTable.1.pCurrent.1	True if peer info is for a “current” peer.
last rx	EST-MIB::wirelessPeerTable.1.pLastRxl.1	seconds since last received packet from peer
last tx	EST-MIB::wirelessPeerTable.1.pLastTx.1	seconds since last transmitted packet to peer
current tx rate	EST-MIB::wirelessPeerTable.1.pCurrentRate.1	current tx rate in bps.

Downloading MIB Tables

To download the MIB items listed above and import into your SNMP server, log into any ESTeem 195Eg and select the **About** page (Figure 17). Press the Download MIB Files hyperlink on the page and save the files to your computer.

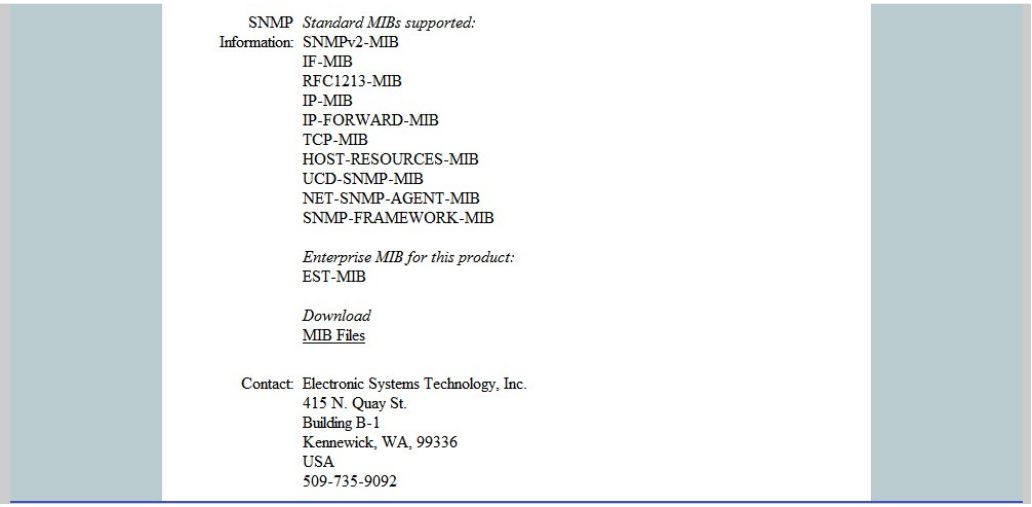


Figure 17: MIB Table Download

APPENDIX H
QUICK START GUIDE

Before You Begin

- The ESTeem Model 195Eg wireless Ethernet radio modem is compatible with many different applications. The most common application is to bridge two or more Ethernet devices or networks. This guide will demonstrate the basic configuration and testing of a pair of 195Eg's. For a more detailed information, please see the ESTeem Model 195Eg User's Manual.

- This guide assumes you have a working knowledge of Ethernet networking, TCP/IP protocol and how to identify and set the TCP/IP address on your computer.

- The 195Eg can be configured using any current web browser software such as Internet Explorer, Netscape or Mozilla.

- The following procedure will provide an initial communication link between two or more Model 195's for testing purposes. All the example commands listed in this guide can be adjusted to fit your communication network. Please consult the ESTeem Model 195Eg User's Manual for more details.

Unpack Contents

Each node in your ESTeem Model 195Eg's network may have different hardware components based upon the final installation location (i.e Outdoor, Indoor, Point-to-point or Muti-Point). Antenna types, cable lengths, power supplies may be different, but the following items will be required for basic setup:

Model 195Eg

AA109 Resource Disk

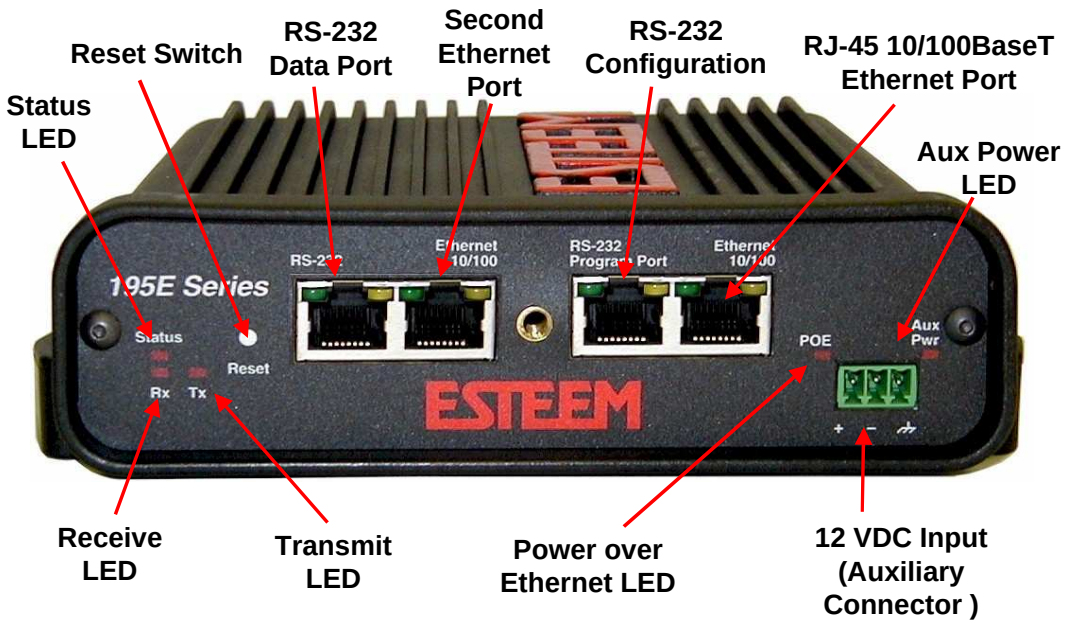
Antenna
(AA01S Displayed)

(2) Ethernet Cables

Power Supply
(AA175 Displayed)

Note: *Your accessory model numbers may vary from the above, but you will need to locate each of above items to continue configuration.*

Front Panel Overview
(RS-232 Data Port and Second Ethernet Port Optional)



Antenna Overview

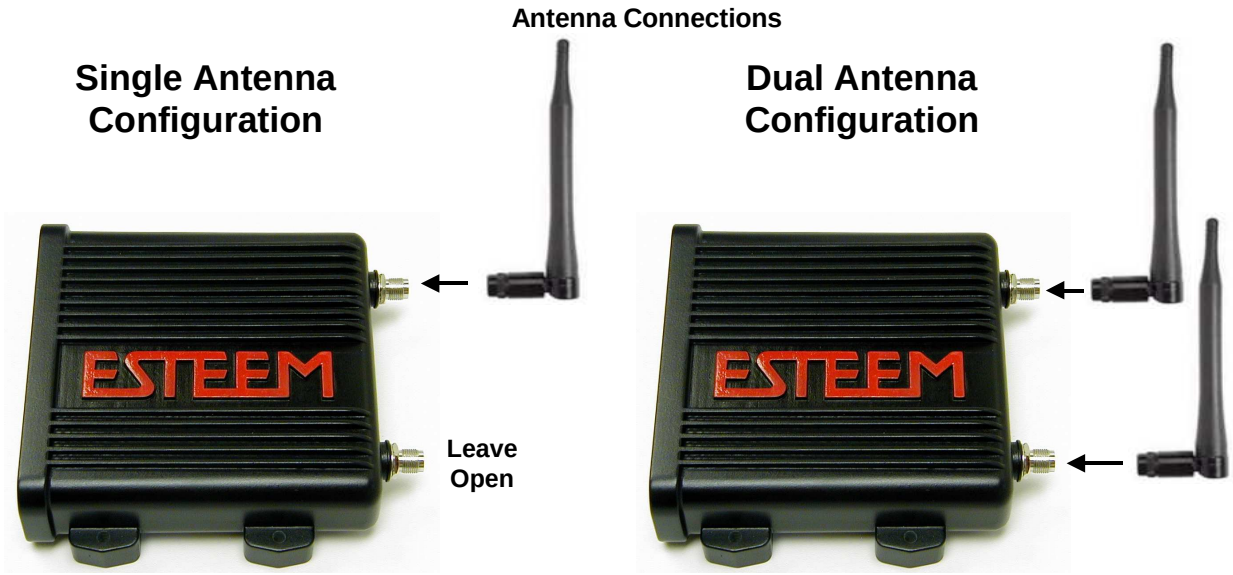
Antenna Port A
(Single Receive Antenna)

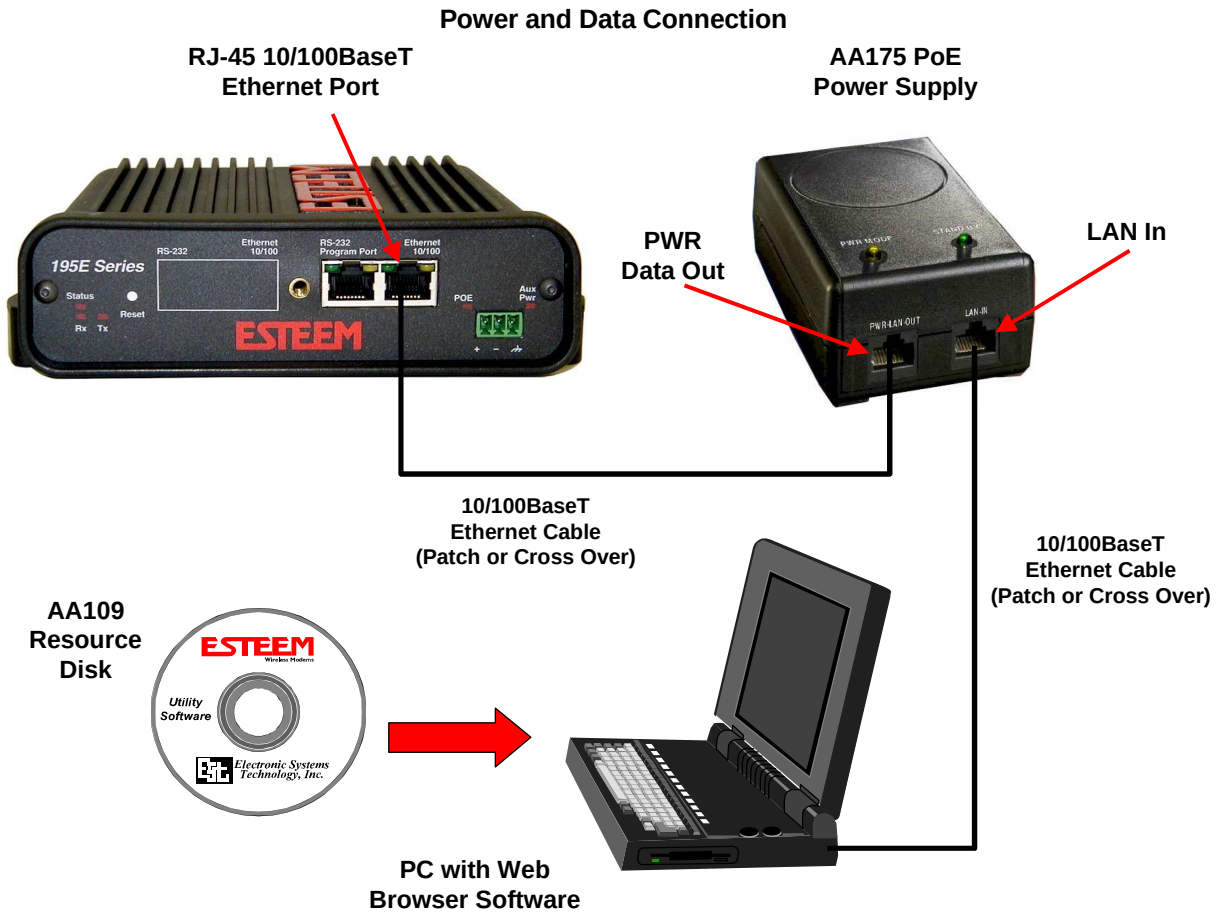
Antenna Port B
(Dual Receive Antennas)

Antenna Connectors
(TNC Female-RP)

Begin Programming

1. Assemble the ESTeem Model 195Eg using the following:




Power and Data Connection
RJ-45 10/100BaseT Ethernet Port
AA175 PoE Power Supply
PWR Data Out
LAN In
10/100BaseT Ethernet Cable (Patch or Cross Over)
10/100BaseT Ethernet Cable (Patch or Cross Over)
AA109 Resource Disk
Utility Software
PC with Web Browser Software

2. The Model 195Eg will link to other Model 195Eg's on the network via the WLAN Media Access Control (MAC) address found on the bottom of the case. This MAC address is six hexadecimal digits separated by colons and is configured at the factory. Every MAC address in the world is unique and can not be changed. Complete the following chart to aid in your configuration:

Name	Serial Number	IP Address	Ethernet MAC	WLAN MAC
Example Modem 1	E-14001	172.16.8.101	00:04:3f:00:01:01	00:04:3f:00:01:02

3. Configuration of the Model 195Eg is completed through the product's internal web server. To access this configuration page, you will need to enter the 195Eg's IP address in your web browser. The IP address set at the factory is Class B (i.e. 172.16.x.x) address and is printed on the Quality Assurance sheet sent with each 195Eg. If the factory default address matches your network configuration, please proceed to **Using Setup,** otherwise continue to step 4.

4. **Install the ESTeem Discovery Utility**. The ESTeem Discovery Utility will allow you to configure the IP address on the Model 195Eg to match your network. Install the Discovery Utility on your computer by inserting the Resource Disk in your CD drive.
Note: The ESTeem Resource Disk is stand-alone copy of the ESTeem Web site (Figure 1). Navigation of the Resource Disk is as simple as using your web browser. All technical documentation, User's Manuals and the ESTeem Utility Program is available on the disk.

   Place the ESTeem Utility CD in your CD-ROM drive. The CD will auto load the ESTeem main page
Note: If the page does not auto load, open your web browser and set your address line to D:\index.html (Where D: is the drive letter for your CD-ROM drive).

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Service
Español
Contact Us
Home
Wireless Solutions...Communications
Technical Support
ESTeem Utilities
Training
Technical Library
RF Design Program
ESTeem Home Page
ESTeem Wireless Modems manufacturers the complete line of ESTeem(TM) wireless products. The ESTeem Wireless Modems are available in High Speed Wireless Ethernet, Licensed Narrow Band Serial, and Unlicensed Spread Spectrum in the VHF and UHF radio communication bands.
The industry leader and patent holder on the wireless modem for over 20 years, EST has been providing the industrial control, public safety, and federal markets with proven and reliable wireless solutions. With our latest advancements to the ESTeem Wireless Ethernet line such as the Model 195Eg, the first 802.11g Wireless Ethernet radio built for the rigors of industrial use, we will again set the standard in the wireless industry!
News
Rockwell Automation
AUTOMATION FAIR
ESTeem Wireless Modems Debuts Latest Industrial Wireless Products >>
November 14, 2007
Automation Fair 2007, Chicago, IL --- November 14, 2007 --- Electronic Systems Technology, Inc. (EST) (OTC: ELST), dba ESTeem Wireless Modems, the manufacturer of the ESTeem

Figure 1 –ESTeem Resource Disk Main Page

From the Support Menu select ESTeem Utilities and click on ESTeem Discovery Utility.

Note: This program is saved in a compressed file format. Microsoft Windows XP® will open the file directly, but other operating systems will require a common compression program such as WinZip available for download at http://www.winzip.com

Double click on the 195EdiscoverySetup.exe file listed in the window to install the program.

ESTEEM
Wireless Modems
About Us
News
Products
Support
Engineering Services
Español
Contact Us
Home
ESTeem Technical Support
ESTeem Utility Programs
Training
Technical Library
RF Design Program
Search:
Search
ESTeem Utility Programs
The following links require a Username and Password to download the Utilities. If you complete the registration form, a Username and Password will be sent to you the next business day or for immediate access, please contact Customer Support at 509-735-9092 (8AM-5PM PST Monday-Friday).
Each ESTeem Utility Program is in a compressed ZIP file. When asked to Open the File or Save to Disk, select Save to Disk. Place the file in its own directory on your hard drive, open the Zip file and run the executable program.
ESTeem Utility Features (Utilities)
Discovery Utility
The Discovery Utility will display all ESTeem 195Eg radio modems connected to the computer's Ethernet connection regardless of their current IP address. This utility will allow modification of the modem's IP address to the network of the computer for further configuration through a Web browser.
ESTeem Models 195Eg, 195Ep and 195Es
NOTE: Firmware version 302.7 Build: 42 or greater in the 195Eg is required.If installing an updated version of the Discovery Program, remove the older utility with the Control Panel>Add/Remove Programs prior to installing the new utility.
ESTeem Discovery Utility (Version 1.1.0.230) (Authorized Users)

Figure 2- ESTeem Utility Download

5. **Set IP Address on the 195Eg**. Connect the Model 195Eg to your computer either direct to the Ethernet card or through a HUB/Switch using a CAT-5e Ethernet cable. The Ethernet port on the 195Eg supports Auto-Negotiation so either a patch cable or crossover cable will work. Open the ESTeem Discovery Program and press the Discover Modems button. The Model 195Eg will be displayed in the program by the Ethernet MAC address and Current IP Address (Figure 3). ***Note:*** *The SSID and Mode of Operation will be adjusted later in the configuration.*

   Double-click on the 195Eg you wish to program and the *Configure IP Address* window will be displayed (Figure 4). Enter an IP address and Subnet Mask for the 195Eg that matches your network subnet and press the OK button to save this to the ESTeem. You will receive notification that the Configuration was Successful and the 195Eg will reboot. Proceed to ESTeem Setup to continue configuration.

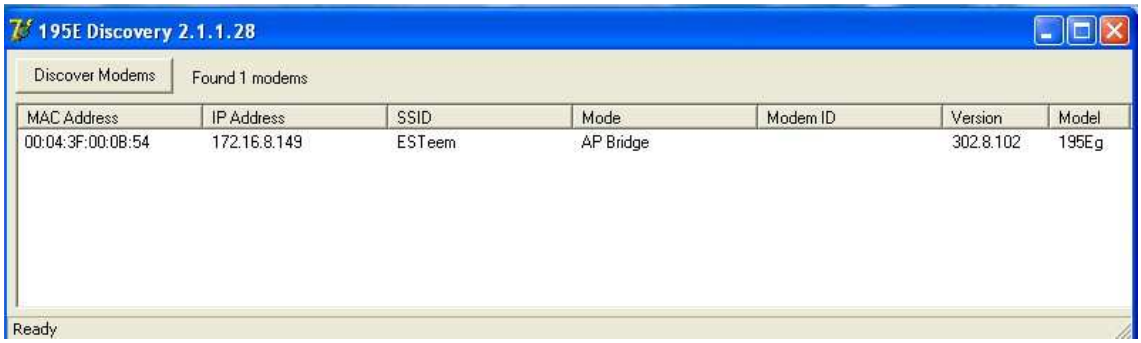


Figure 3 – Discovery Program Main Page

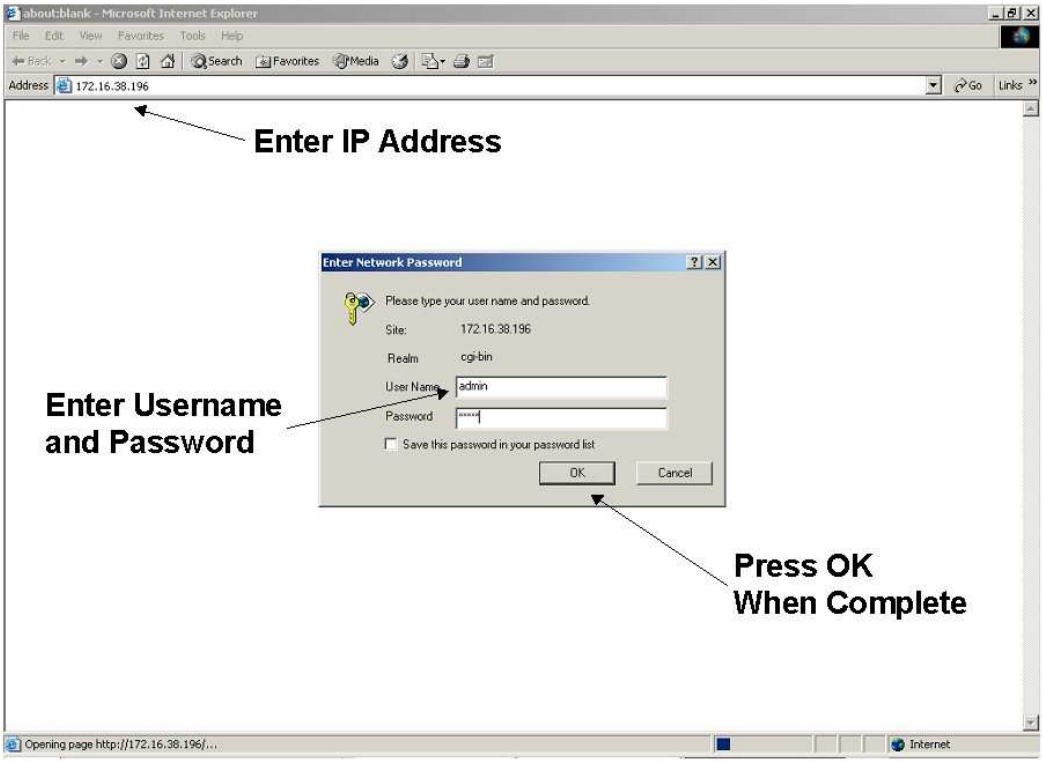
Setup Programming

You should now be ready to configure the Model 195Eg through your web browser. Open the web browser program and enter the IP address of the ESTeem in the address line and press enter.

Figure 4 – Change IP Address Window

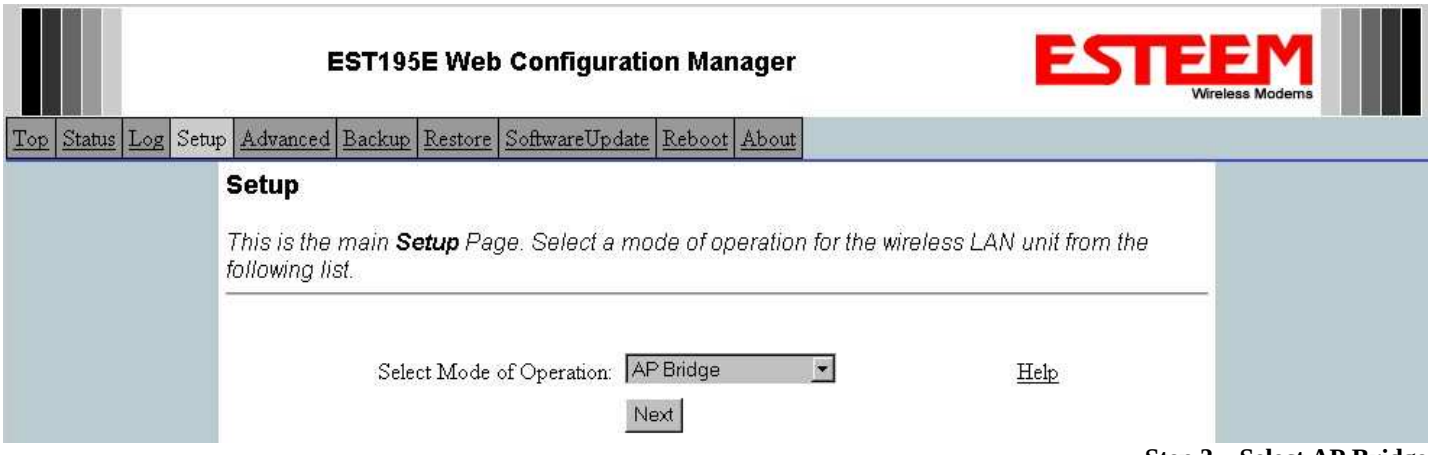
1. When prompted, enter **admin** for both the username and password and press the OK button.

2. Select Setup on the top menu.



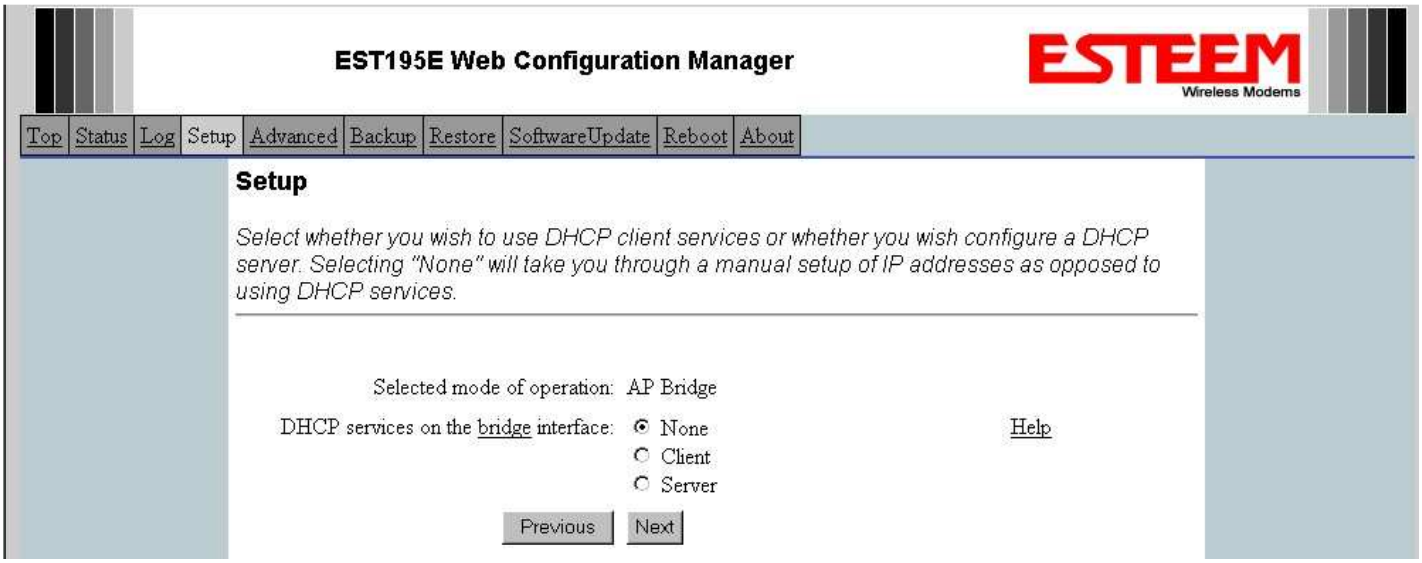
Step 1 – Sign-In Screen

3. Press the drop-down menu and select AP Bridge and press the *Next* button.


EST195E Web Configuration Manager
ESTEEM Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
This is the main Setup Page. Select a mode of operation for the wireless LAN unit from the following list.
Select Mode of Operation: AP Bridge
Help
Next

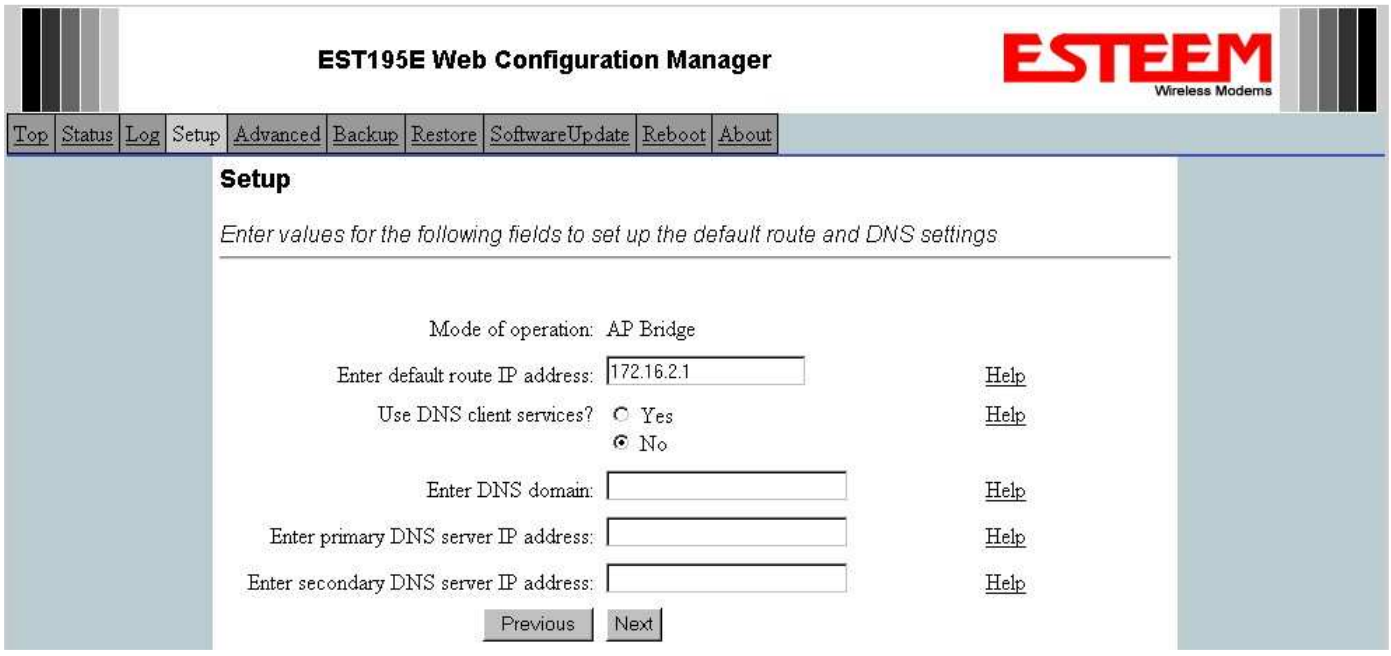
Step 3 – Select AP Bridge

4. Set the DHCP services to OFF and press the *Next* button.


EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Select whether you wish to use DHCP client services or whether you wish configure a DHCP server. Selecting "None" will take you through a manual setup of IP addresses as opposed to using DHCP services.
Selected mode of operation: AP Bridge
DHCP services on the bridge interface: None Client Server
Help
Previous Next

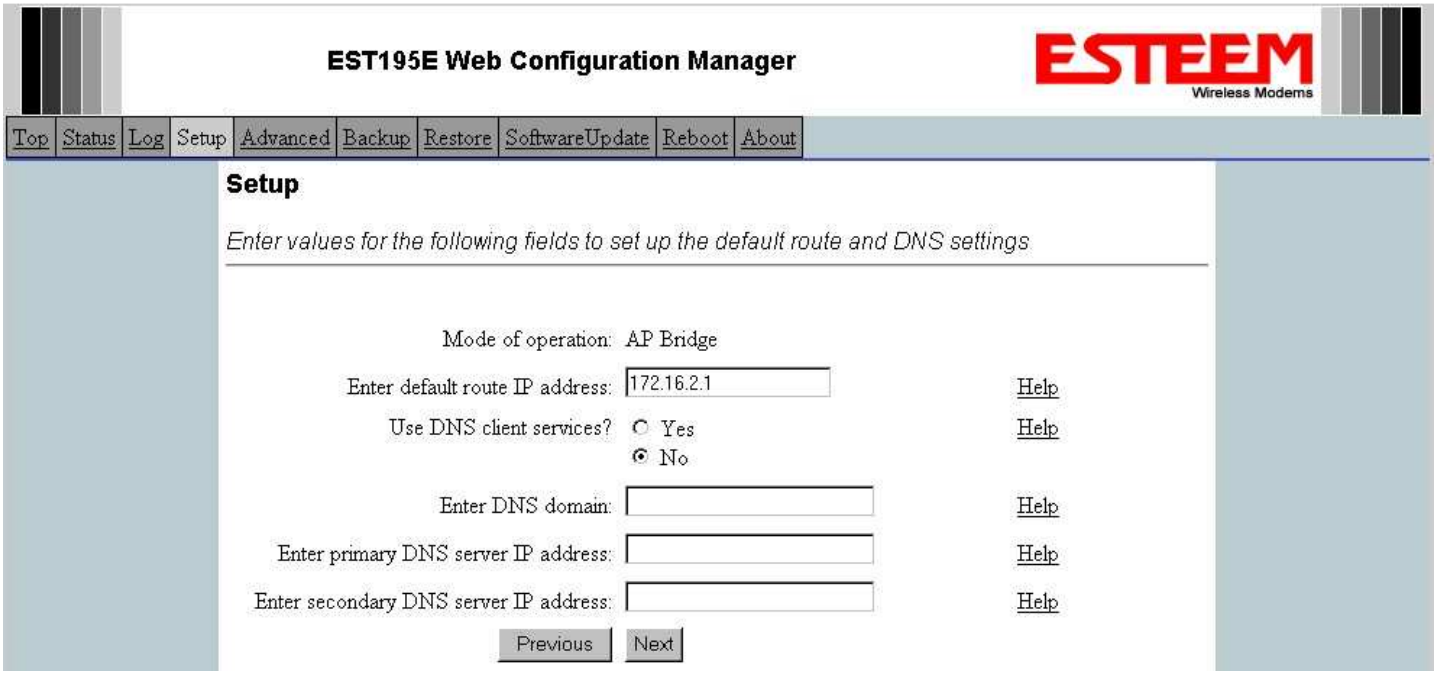
Step 4 – Turn DHCP Off

5. Verify the IP address and netmask for the 195Eg (listed as **bridge** device) are correct press the *Next* button.


EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter values for the following fields to set up the default route and DNS settings
Mode of operation: AP Bridge
Enter default route IP address: 172.16.2.1
Use DNS client services? Yes No
Enter DNS domain:
Enter primary DNS server IP address:
Enter secondary DNS server IP address:
Help
Previous Next

Step 5 – Verify IP Address

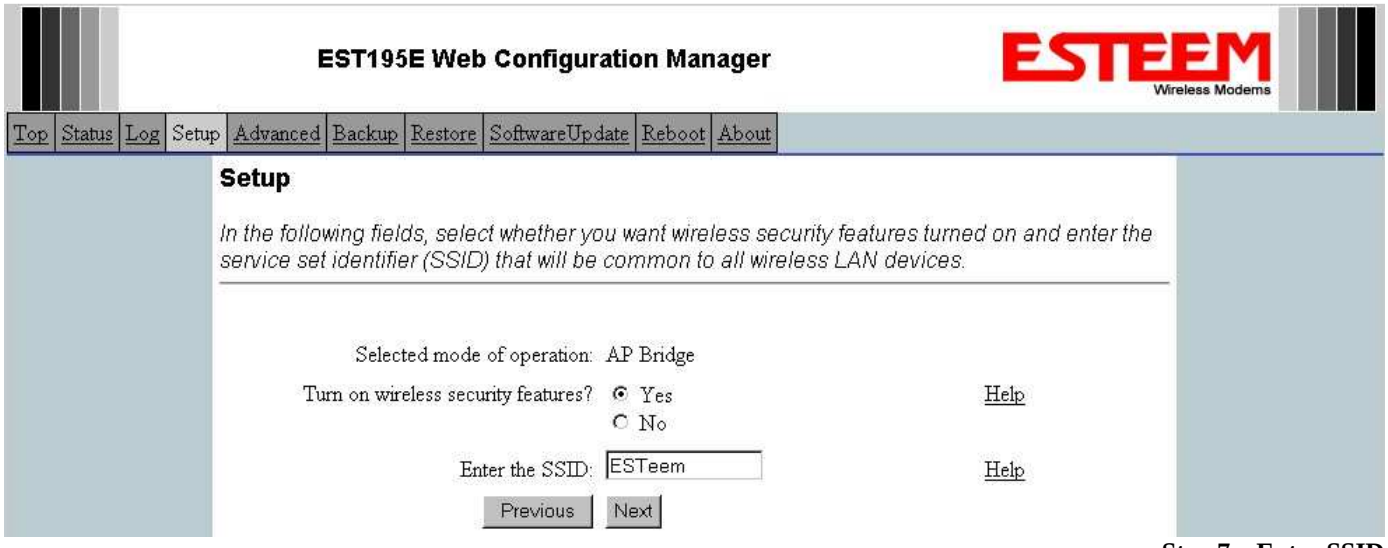
6. Enter in the Gateway address in the default route IP address block and any DNS information for the server. If this is not know or on a network without a Gateway, leave these items at factory default.


EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Enter values for the following fields to set up the default route and DNS settings
Mode of operation: AP Bridge
Enter default route IP address: 172.16.2.1 Help
Use DNS client services? Yes No Help
Enter DNS domain: Help
Enter primary DNS server IP address: Help
Enter secondary DNS server IP address: Help
Previous Next

Step 6 – Enter Gateway Address

7. All 195Eg modems in the network must be have the exact same Service Set Identification (SSID). The default SSID is **ESTeem** and we will use this for demonstration. Enter the SSID as listed above and turn off the wireless security features by selecting the NO radial. Press the *Next* button to continue.

***Note**: It is recommended that security be used in all wireless applications. This procedure will forgo the security configuration for brevity. Please see the example applications and the security appendix for further information.*


EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
In the following fields, select whether you want wireless security features turned on and enter the service set identifier (SSID) that will be common to all wireless LAN devices.
Selected mode of operation: AP Bridge
Turn on wireless security features? Yes No Help
Enter the SSID: ESTeem Help
Previous Next

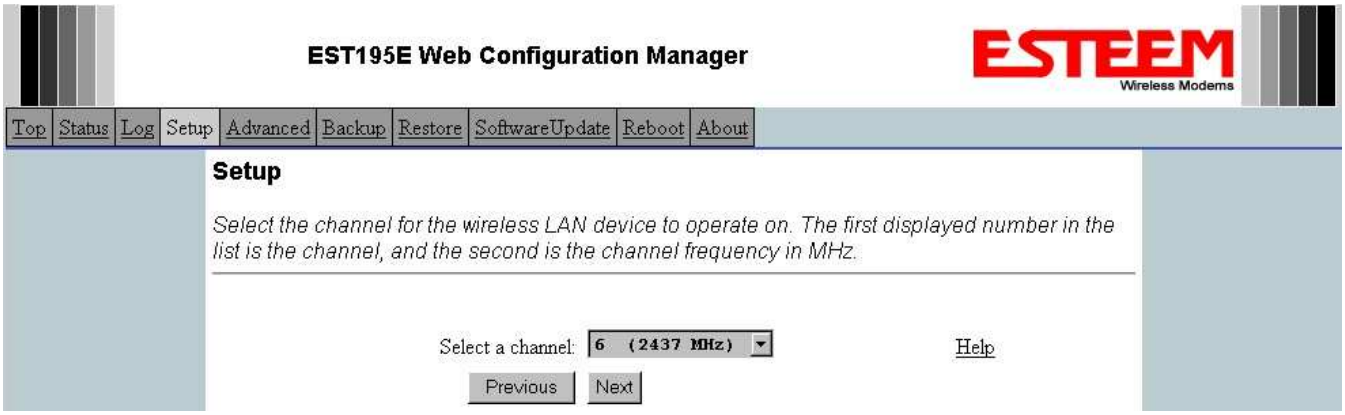
Step 7 – Enter SSID

8. A warning that wireless security is not enabled will be displayed. Press the *Next* button to continue.

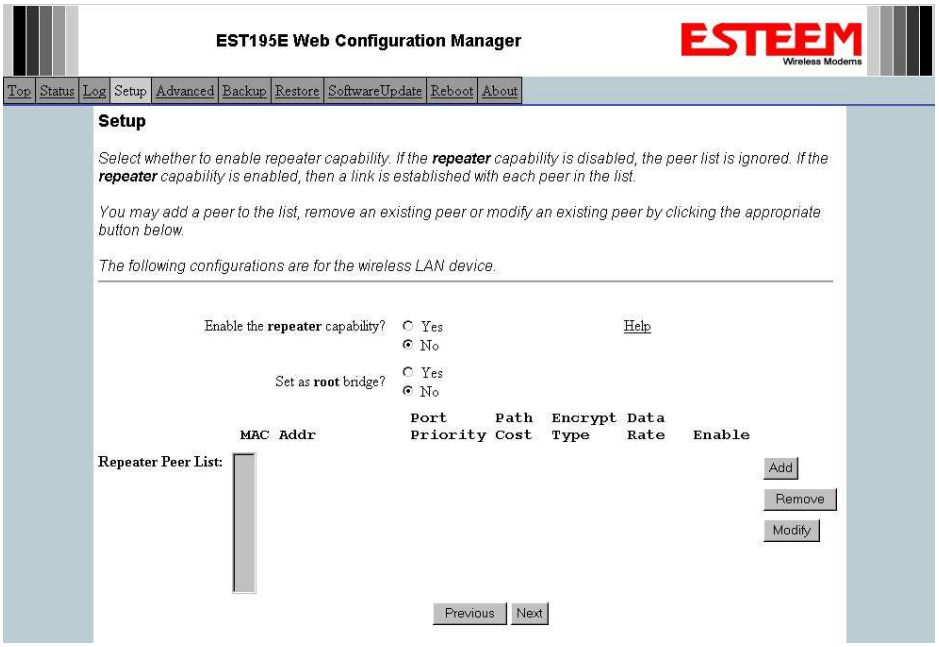
EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
WARNING!
You have chosen to configure your system without any of the security features enabled on the wireless interface(s). This choice will expose your data to eavesdroppers and allow the general public to connect to your network. If you are sure this is what you want, press "Next". Otherwise press "Previous" and change your "wireless security" choice.
Previous
Next

Step 8 – Security Warning Screen

9. All Model 195Egs on the network must be on the same radio channel, representing a particular frequency. If a particular channel has not been assigned for use, leave the 195Eg at a default value of **6** and press the *Next* button.

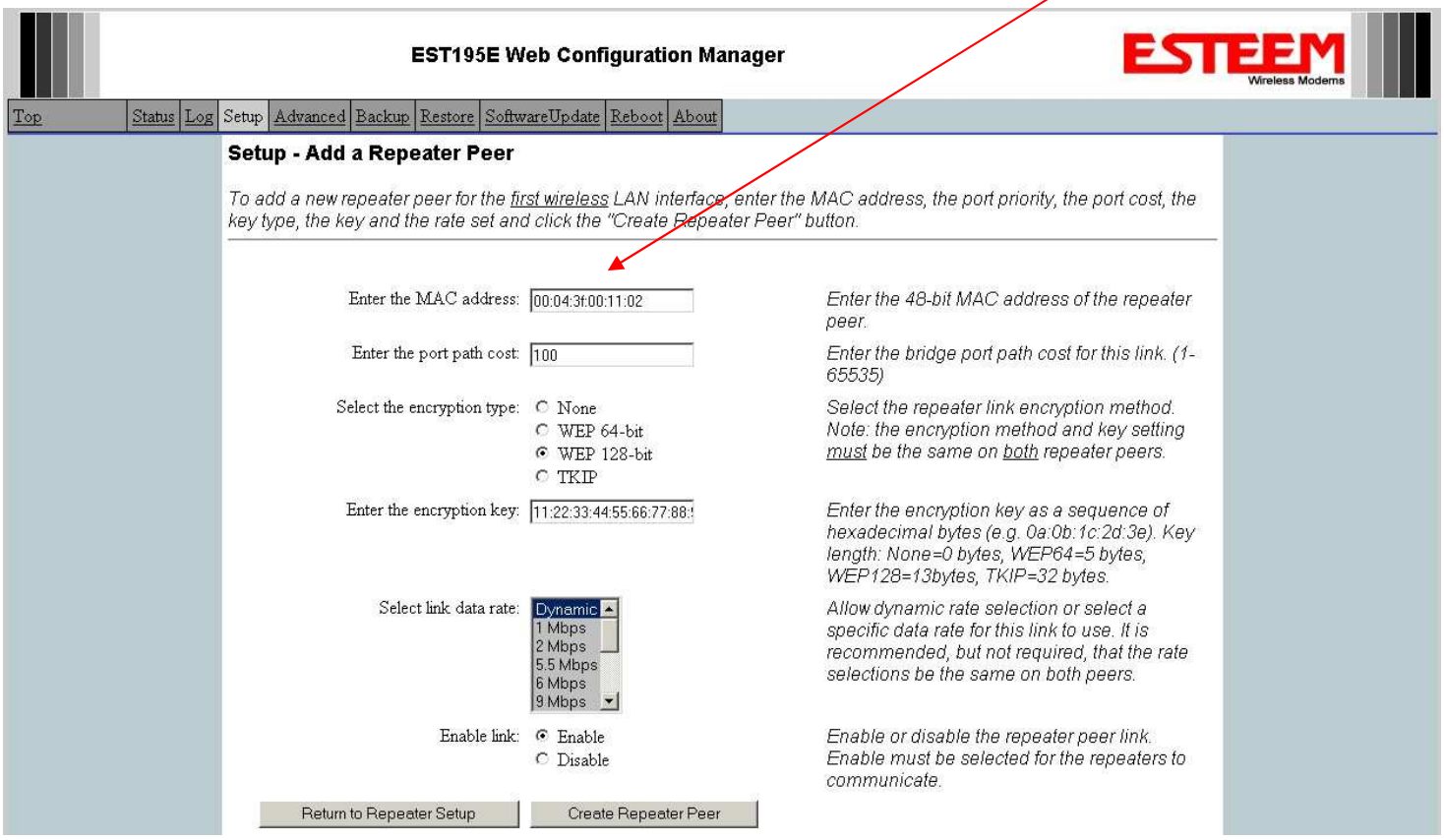

EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Select the channel for the wireless LAN device to operate on. The first displayed number in the list is the channel, and the second is the channel frequency in MHz.
Select a channel: 6 (2437 MHz)
Help
Previous
Next

Step 10 – Set Radio Channel


EST195E Web Configuration Manager
Wireless Modems
Top Status Log Setup Advanced Backup Restore SoftwareUpdate Reboot About
Setup
Select whether to enable repeater capability. If the repeater capability is disabled, the peer list is ignored. If the repeater capability is enabled, then a link is established with each peer in the list.
You may add a peer to the list, remove an existing peer or modify an existing peer by clicking the appropriate button below.
The following configurations are for the wireless LAN device.
Enable the repeater capability? Yes No
Help
Set as root bridge? Yes No
MAC Addr
Port Priority
Path Cost
Encrypt Type
Data Rate
Enable
Repeater Peer List:
Add
Remove
Modify
Previous
Next

10. Configure the repeater peer list by selecting Enable the repeater capability radial to YES (Above). Press the *Add* button to the right of the repeater peer table and, using the chart created in the **Begin Programming** section of this guide, enter the Wireless MAC (WLAN MAC) address of the opposite 195Eg (the 195Eg this unit you are programming will communicate with) in the Peer 1 – MAC Addr field (right). Leave the Priority and Cost settings at the default values and change the Enable Link radial to Enable and press the *Create Repeater Peer* button. Press the *Next* button.

Example Addresses				
Name	**Serial Number**	**IP Address**	**Ethernet MAC**	**WLAN MAC**
195Eg We Are Programming	E-14096	172.16.48.189	00:04:3f:00:01:01	00:04:3f:00:01:02
Opposite 195Eg We Will Create Wireless Link	E-14034	172.16.38.114	00:04:3F:00:0B:00	00:04:3F:00:11:02


EST195E Web Configuration Manager
ESTEEM
Wireless Modems
Top
Status
Log
Setup
Advanced
Backup
Restore
SoftwareUpdate
Reboot
About
Setup - Add a Repeater Peer
To add a new repeater peer for the first wireless LAN interface, enter the MAC address, the port priority, the port cost, the key type, the key and the rate set and click the "Create Repeater Peer" button.
Enter the MAC address:
00:04:3f:00:11:02
Enter the 48-bit MAC address of the repeater peer.
Enter the port path cost:
100
Enter the bridge port path cost for this link. (1-65535)
Select the encryption type:
None
WEP 64-bit
WEP 128-bit
TKIP
Select the repeater link encryption method. Note: the encryption method and key setting must be the same on both repeater peers.
Enter the encryption key:
11:22:33:44:55:66:77:88:
Enter the encryption key as a sequence of hexadecimal bytes (e.g. 0a:0b:1c:2d:3e). Key length: None=0 bytes, WEP64=5 bytes, WEP128=13bytes, TKIP=32 bytes.
Select link data rate:
Dynamic
1 Mbps
2 Mbps
5.5 Mbps
6 Mbps
9 Mbps
Allow dynamic rate selection or select a specific data rate for this link to use. It is recommended, but not required, that the rate selections be the same on both peers.
Enable link:
Enable
Disable
Enable or disable the repeater peer link. Enable must be selected for the repeaters to communicate.
Return to Repeater Setup
Create Repeater Peer

Step 10 – Configure Peer Table

11. Press the *Commit Changes* button and the modem will save all the changes made and reboot. The reboot time is approximately 1 minute to be ready for operation.

12. Complete all steps in this **Setup Programming** section for the other Model 195Eg's you will be testing before moving on the Testing Communication section.

Testing Communication Link

After you have configured at least two of the Model 195Eg wireless Ethernet modems for operation, you can verify communication with each the following steps:

Status Light – The quickest source of link status is to view the Status Light on the face of the 195Eg. If the Status light is solid, the Model 195Eg has a connection to another Model 195Eg listed in the Peer Table.

Status Screen/Peer Table – To view further information on the status of the communication link (such as connection speed, signal strength and last update time) you can open the Status Screen from the Web Interface. After press the Status tab at the top of the screen the Status: Summary will be displayed showing the status of all ports and memory in the 195Eg. Under the Wireless Status heading click on the View Peer Table (Figure 5). The Peer Table will list all other 802.11b or 802.11g wireless activity seen by the 195Eg and how it is classified.

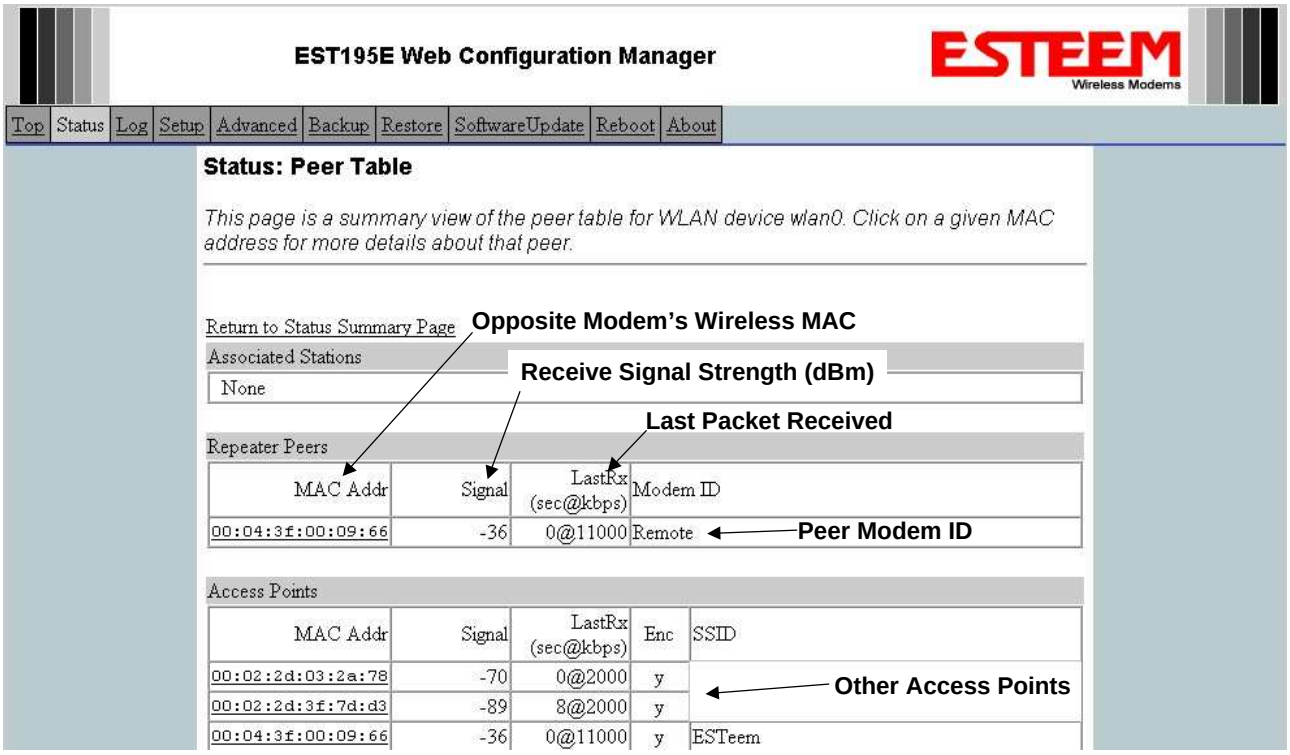
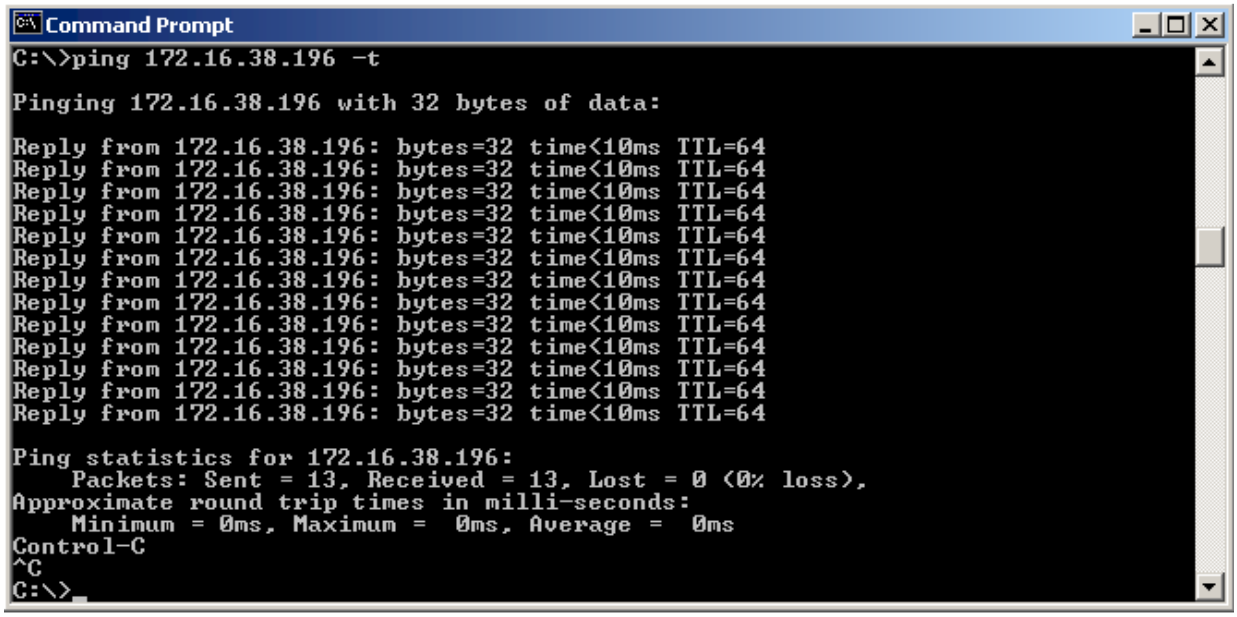


Figure 5 – Repeater Peer Table

Find the opposite 195Eg in the Repeater Peers list and information such as signal strength (in dBm) and time/speed of last data packet will be displayed.

***Note**: The data rate displayed is not necessarily indicative of the RF data rate between the ESTeems. The rate show in the Repeater Peer table will be the last RF packet, which could consist of either data, repeater beacon or network probes. For a detailed analysis on the data rate, please consult the ESTeem User's manual.*

Ping Testing – The easiest method for testing the efficiency of data flow between the ESTeems is to conduct a Ping test to the opposite modem's IP address. This will test all links in the Ethernet bridge.



Technical Support

User's Manual and Technical Documentation
http://www.esteem.com

E-Mail Support
Support@esteem.com

Phone Support (8AM to 5PM PST Monday-Friday)
509-735-9092